Social Effects of the Scientific and Technological Revolution Under Capitalism

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INTRODUCTION

Science and technology are today developing at an ever increasing rate. The outstanding achievements of modern science and technology, which have been embodied in spaceships and automatic space devices, in lightning-quick electronic computers, in atomic power stations, in the deciphering of the genetic code, in the transplantation of human organs, and in many other fields have increased the impact of man on his environment. At the same time these achievements have fundamentally affected the relations between people. Never before have science and technology intruded so insistently upon the various spheres of man's social activity, forcing him to change his concepts of the world and of himself.

The scientific and technological revolution now proceeding before us in full view shows how important is the question of the driving forces of society, the aims of social progress and the rate of this progress. Other questions of paramount importance are the role and place of working people in the technically highly

developed system of production and control, the question of what constitutes work and recreation, how the increasing efficiency of labour should be utilized, the inter-relation of man and his natural environment, and similar vital considerations.

The social aspects of modern scientific and technological development concern everyone. For many people the introduction of new technology creates a serious problem of adaptation to new conditions, even though the scientific and technological revolution has made only its very first steps as yet. On the social plane, technological progress is closely interconnected with the most important problems of our time—the problems of war and peace, of want and social inequality, and of democratic and social changes.

In recent years many books and pamphlets have been published dealing with the economic and social problems accompanying the scientific and technological revolution. These problems have been high on the agenda at many conferences, symposiums and scientific discussions. Very often there are irreconcilable differences of opinion over these questions, which reflect opposed class interests, and behind which rages the battle between progress and conservatism and reaction.

Marxist teachings have a direct bearing on the problems of the scientific and technological revolution and make an important contribution to their solution. Marxism has always attached great importance to the development of the forces of production, regarding them as the most important objective condition for social

progress. The works of Marxist scholars and the records and documents of conferences of Communist and Workers' Parties contain a profound analysis of the contradictions of the scientific and technological revolution and its influence on the structure and position of the working class and on the development of the class struggle in the capitalist countries. Marxist scholars have explained the reasons for the radically different forms and consequences the unfolding scientific and technological revolution has had in the capitalist and socialist countries and have analyzed the role of this revolution in the economic competition between the two world systems—socialism and capitalism. Important contributions to the further elaboration of these questions were made at the International Meeting of Communist and Workers' Parties held in Moscow in 1969 and at the 24th Congress of the Soviet Communist Party.

At the same time it should be noted that analysis of the complicated processes born of the scientific and technological revolution has only begun and the study of many of the problems is far from complete. Also, the social impact of the scientific and technological revolution is very wide, ranging over practically all aspects of social life.

The present work includes only some of the social aspects and problems of the scientific and technological revolution, the great significance of which has now been properly evaluated. The emphasis has been laid on the advanced capitalist countries where the social consequences of the scientific and technological revolution, bound up as they are with the proces-

ses born of the deepening crisis of capitalism, have revealed themselves with sufficient clarity.

The last chapter of this book considers the social consequences of the scientific and technological revolution and the problems arising therefrom in the conditions of an advanced socialist society—the Soviet Union.

1. BASIC FEATURES OF THE SCIENTIFIC AND TECHNOLOGICAL REVOLUTION

The profound social consequences of present-day progress in science and technology reflect the revolutionary nature of this progress, its far-reaching achievements.

There are various points of view as to what constitutes the substance of the scientific and technological revolution. Some authors see this substance only in certain of its aspects, such as the great importance of science, the manufacture of synthetic raw materials, etc. The different views and the differences in the understanding of the substance of the scientific and technological revolution can also be seen in the variety of general definitions of the present-day epoch as "the age of electronics", "the age of cybernetics", "the age of automation", "the atomic age", "the cosmic age", etc.

Such definitions are insufficient, of course, because the present-day scientific and technological revolution is a whole complex of interconnected qualitative changes in the means and tools of labour, in technology and the organi-

zation of production, in power resources, and in the content of labour. Taken together these changes have resulted in raising the forces of production to a qualitatively new and higher plane.

The current revolution in the forces of production, as distinct from the technical revolutions of the past, is based on the systematic utilization and tremendous expansion of scientific knowledge. For example, most of the knowledge the world has today has been accumulated during the life of the present generation, while the amount of research to be carried out in the next 10-20 years will equal the amount done throughout the entire history of science.

The revolution in science, which is the result of fundamental discoveries in physics, chemistry and biology has given man much more powerful means to use in the conquest of nature. In the past the connection between science and production was for a long time an indirect one. Now scientific research has become an indivisible part of the sphere of material production. The prediction made by Karl Marx about the transformation of the process of production into a material, substantivized science is coming true. [1]

In the course of this process science fuses with production, which serves to enrich both of them. Research institutes and laboratories have become factories of discoveries, producing ideas for industry and developing new types of pro-

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[1] K. Marx, F. Engels. *Coll. Works,* Vol. 46, part 2, p. 221, Russ. Ed.

ducts, new technological processes, devices and technological means.

The amount of time it takes to introduce scientific discoveries into the production process has become much shorter. Whereas the time that passed between the discovery of electricity and its utilization was about 50 years, and approximately the same period divided the discovery and utilization of telephone communication, it took a mere five years to put transistors to industrial use and little more than a year for lasers. It has been estimated that the average time it takes to introduce a major technical discovery into industry has shrunk to one half of what it was at the beginning of the 20th century, while the period of development and testing has been reduced to less than one-third.

Many new branches of industry (such as nuclear power engineering, the electronics industry, space technology) owe their existence entirely to scientific discoveries of recent years—striking evidence of the importance science has acquired as a productive force of our time.

The scientific and technological revolution is thus gradually transforming all the three fundamental material elements of production: the mechanical means of labour (automation), the objects of labour (artificially made substances with properties predetermined by man) and sources of energy (wide use of liquid and gaseous fuel, development of nuclear power). The revolution affects all stages of production from the acquisition of raw material to the sale of ready-made products.

Machines that control and direct

The various directions scientific and technological progress has taken are closely linked, but the principal direction of this progress has been the revolution in mechanized forms of work through the automation of production.

Some economists see automation as nothing but an extension of mechanization, as just a "new name for an old process". But one can hardly agree with this view. Automation is not a mere extension of mechanization, the result of specialization and standardization, but a qualitatively new step in technological development.

Those who consider that the present-day stage of scientific and technological progress is nothing radically new tend to divorce technological advance from the development of social processes, and ignore the qualitative changes in the nature of the mutual relationship between technology and man. Meanwhile, the most important and drastic changes in the technology of production have led to radical changes in the technological nature of the relationship between man and machine. Such changes have been brought about by automation. In the preceding stage of technological progress—mechanization—the function of the direct effect on the object of labour was transferred to the working mechanism. Here, however, man remained the principal agent of the technological process. He retained the functions of control, regulation and direct intervention in the production process in order to eliminate the possibility of any deviation from normal. With the advent of automa-

tion these functions were transferred to the mechanical device. The properly functioning automated production process does not entail the direct participation of man, who is relieved of any forced technological connection with the machine. The automation of production enables man to operate machines with the help of other machines.

The very concept of the machine has changed. Whereas before the machine was understood to be an artificial device made by man to replace certain production functions, now machines discharge not only production but also intellectual, and in some cases even physiological, functions. At the present stage of technological progress new types of machines— control-and-regulatory, logical and cybernetic— have been added to the earlier familiar classes of machines—power generating, transport and technological.

A characteristic feature of the scientific and technological revolution is the creation and wide utilization of managerial machines based on the practical application of the theory of control (cybernetics).

The old-type machines made it possible to increase the power of the instrument of labour far beyond the physical capacity of man. The introduction of automation increases the powers of the instruments of labour beyond the reflex potential and other limitations of the human organism. Whereas the ordinary machine, figuratively speaking, extends and strengthens the working man's hands, automation makes not only his hands stronger, but also his intellect. The automated system, besides fulfilling the

requirements of the earlier pre-fixed programme, can even perfect it.

The system of "feed-back" control, which hinges on man, a clumsy and slow system by modern standards, has been replaced, through automation, by electronic-control devices that process tremendous amounts of information, working at speeds close to the speed of light.

The invention of the electronic computer has been one of the most striking developments in the history of the scientific and technological revolution of the 20th century. In the comparatively short time of 15-20 years, four generations of these machines with high-performance characteristics have come into being.

The latest computers can perform several million operations in the space of just one second. They have memory banks which can store information equal to 5,000 books of medium size.

Thanks to the use of computers the scientific and technological revolution has moved into the area of control, management and planning of production. The computer has made it possible to solve one of the fundamental contradictions of our time, the contradiction between the avalanche of information and the physical limits of man to absorb and effectively use this information.

New raw-material and power base

One of the important aspects of the present-day scientific and technological revolution is the changed raw-material base of production, the ever wider utilization of new materials which

do not occur in nature. The deep penetration of science into the laws of the structure and transformation of matter, and the laws of the emergence and occurrence of chemical reactions has made it possible to synthesize substances and materials with predetermined properties. The utilization of artificial and synthetic materials, in turn, makes it possible to evolve more economical technological processes, and reduces man's dependence on nature.

The modern industrial system would be unable to function without the large-scale production and consumption of electric power. Electricity is the main source of power in industry and is used to a large extent in transport. Its use in various technological processes is constantly increasing. Despite the priority accorded to power construction, even the most advanced countries have not been able to satisfy their requirements for this type of power.

The growing use of electric power to replace physical labour is one of the most important factors behind growing labour efficiency, and this fact determines the great importance of the transformations that are taking place in the power base of production under the influence of the technological revolution. The first stage of these transformations was the gradual transition from comparatively expensive solid fuels to more economical liquid and gaseous fuels. The next stage consists in the transition to the entirely new sources of energy inherent in matter itself.

The great scientific discoveries of the 20th century have led to the creation of atomic energy. Initial estimates regarding the future of nu-

clear energy were contradictory, interpreted at various times as promising and as hopeless. One of the barriers to the industrial utilization of nuclear energy was the very high capital costs involved. Now, however, we have a clearer idea regarding the future of nuclear energy. In the late 1960s the cost of producing electricity at large atomic power stations had come close to the cost of power generated at conventional power stations. In the future, nuclear engineering will most probably develop on the lines of breeder reactors, using the more widely available thorium, instead of uranium, and, what is still more important, re-using the nuclear fuel they reproduce.

In the more distant future, thermo-nuclear power engineering based not on the fission of heavy nuclei of uranium and plutonium, but on the fusion of lighter nuclei, will, it is hoped, open up tremendous sources of power. The thermo-nuclear method of power production will release about ten times more of the latent energy of nuclear particles than atomic power production does today.

We can agree, in general, with the estimate of the American Atomic Energy Commission that by 1980 atomic power stations will account for 23-30% of all power produced, while in the year 2000 this figure will rise to 50%.

Thus, the interconnected complex of qualitative changes in the forces of production, which is what underlies the scientific and technological revolution, makes science an important element of production. Science serves to automate the economy with the help of cybernetics, it produces new raw materials, and transforms

the power base. The revolution also changes radically the content of labour and gives man a new role in the whole system of production.

Distinguishing features of the scientific and technological revolution

The present-day scientific and technological revolution has a number of specific features which distinguish it from the industrial revolution of the 18th and 19th centuries and other revolutionary developments in the tools and means of production. In the first place it surpasses all previous technological transformations in its scope. The industrial revolution of the 18th and 19th centuries, which began in the textile industry, spread to other branches, converting them on the basis of machine production, and giving rise to new industries. However, its main sphere remained industry, transport and communications.

In contradistinction the modern scientific and technological revolution, from the very beginning, has served to transform not only industry, transport, communications and the power system, but also agriculture and non-productive spheres such as trade, finance and even the state apparatus.

At the present stage, the development of the productive forces is attended by an expansion in the sphere of exchange between man and nature. This sphere now includes, to a much greater extent than before, the seas and oceans, which occupy 70% of the earth's surface. And

more recently it also includes circumterrestrial space and other planets of the solar system.

The rate of scientific and technological advance has grown considerably. There have been more changes in science and technology over the past few years than occurred in several decades in the last century, to say nothing of more distant times.

The socio-political aspect of the present-day scientific and technological revolution is also important. The revolution is taking place in the historical epoch of the transition from capitalism to socialism, in the epoch when socialism is becoming the determining factor of the world revolutionary process.

The scientific and technological revolution is developing both in countries whose economies are based on the exploitation of hired labour and in countries whose economies are based on the free labour of those who own the means of production. There is an increasingly significant connection between the scientific and technological revolution and socio-political revolutionary processes.

The present-day scientific and technological revolution has many and far-reaching economic consequences. In the first place, the amount of machinery available to labour has grown considerably. The efficiency of the means of production and the accumulation of scientific and technical knowledge is now responsible to a much greater degree for the creation of national wealth than the amount of direct labour used, as was the case in the past.

The increased speed and intensity of production processes, the unitizing of machinery, the

introduction of optimal regimes for technological processes, the introduction of new technological processes and new materials, and new methods of managerial control, make it possible to raise the efficiency of production to a much higher level than before.[1] For the first time technical prerequisites have emerged for the creation of a real abundance of material and cultural benefits.

The application of the achievements of modern science and technology considerably raises the efficiency of the means of production. Moreover, a new correlation has emerged between the rate of growth of efficiency of the machines and the rate of growth of their cost, with the rate of growth of productivity tending to be ahead of the rate of growth of the cost of the equipment used. This new correlation enhances the importance of economic development through intensification, when production growth is achieved not so much by way of increases of labour and capital as through the more intensive utilization of both. In this connection important changes are taking place in the industrial structure and in the economy as a whole. Greater efficiency of the means of production reduces capital investment requirements and the consumption of material.

The revolution in the technical basis of production is inseparable from the revolution in

[1] It should be noted that the adoption of the latest achievements in science and technology is not always directly reflected in per-hour production indices. These achievements often result in higher quality indices or in an increased variety of new articles.

the functions and composition of the personnel engaged in the process of production, for it inevitably affects the quality of the work force and the relations between people engaged in production.

Factors behind the acceleration of scientific and technological progress in the post-war period

Speaking of an "industrial" or a "post-industrial" society, many Western observers view scientific and technological progress as an independent process that is attended by social changes. This approach is particularly evident in the works of Professor Leslie A. White of the United States, who says that "technology is the independent variable, the social system the dependent variable."[1] The dialectics of the correlation between the productive forces and production relations, discovered by the founders of Marxism and borne out by the entire course of history, is completely ignored in these theories. Because of this, the authors of such theories are able to indulge in painting illusory pictures of the unlimited progress of capitalism while ignoring the acute social problems and contradictions which hold back scientific and technological progress in their countries.

The theoreticians of the "industrial" and "post-industrial" society deliberately shut their eyes to the fact that at the present stage capitalist production relations are not the optimal social form for the development of the productive

[1] Leslie A. White. *The Science of Culture,* N.Y., 1949, p. 365.

forces, that they are holding back and deforming scientific and technological progress. Today's state-monopoly capitalism is to a great extent transforming the mighty creative forces of science and technology into a destructive force. It curbs free competition and turns the productive forces into a mere tool for profit-making. It impedes economic, scientific and technological progress in the developing countries by squeezing super-profits out of them, and by supporting any reactionary political regimes that are willing to serve the monopolists.

Practice has shown the error of overestimating the independent role of the productive forces and of ignoring the many-sided dialectical nature of the interrelation between the productive forces and production relations. Unfortunately such concepts have been reflected in Marxist literature as an absolutization of the monopolist tendency towards curbing technical progress or even as postulating the impossibility of a scientific and technological revolution under capitalism.

Such concepts consign to oblivion one of the basic principles of historical materialism, i.e. the leading role of the productive forces in the system of production. They boil down to the threadbare theory of the stagnation of the production forces and the "automatic collapse" of capitalism, a theory actually alien to Marxism.

Marxists have always regarded important transformations in the material and technical basis of production as a revolutionary force which, in a world of antagonistic class formations, finally leads to a revolutionary explosion and to the emergence of new social formations.

"The bourgeoisie cannot exist without constantly revolutionizing the instruments of production, and thereby the relations of production, and with them the whole relations of society." [1] This thesis of the "Manifesto of the Communist Party" fully applies to modern capitalism.

The monopoly form of capitalist ownership of the means of production weakens the pressure of competition, and by economic levers holds back technological progress. This, however, does not mean that it completely arrests such progress. Lenin warned against this oversimplification: "It would be a mistake to believe that this tendency to decay precludes the rapid growth of capitalism. It does not... certain countries betray, to a greater or lesser degree, now one and now another of these tendencies. On the whole, capitalism is growing far more rapidly than before..." [2] It has been proved in practice that the transition of capitalism to the monopoly stage does not preclude its development or the acceleration of technological progress.

Under imperialism, the monopolies exist side by side with competition, constantly bringing forth new forms of competition. This causes monopoly capital to try to reduce production expenses through improved technology and other means.

The high capital/labour ratio enhances the importance of economy in the application of fixed capital as a means of raising the rate of

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[1] K. Marx, F. Engels. *Selected Works*, Vol. 1, p. 111.
[2] Lenin. *Coll. Works*, Vol. 22, p. 300.

profit. The computer which automatically controls the operation of equipment is a brilliant technical means of using capital equipment to maximum advantage. That is why automation plays such an important part in industries with a high capital/labour ratio. It also plays an important role in branches with continuous production where both primary raw material and the finished product are gaseous, liquid or granular in form. The branches which are most suitable for full automation include the oil-refining industry, most branches of the chemical industry and some branches of the food-processing industry.

Here, as before, the main incentive for the introduction of new technology is the desire to reduce labour overheads. The capitalists are also guided by their fear of the organized front of the working class and the rising strike movement; they act according to the principle: "the machines do not go on strike" [1] In addition to this, modern machinery is connected with an increase in the proportion of white-collar personnel, who are to a much lesser extent union-influenced or controlled and who are therefore more inclined to co-operate with the management.

It is worthy of note that the tendency towards accelerated progress in science and technology became pronounced immediately after the Second World War. Bourgeois economists

[1] J. Galbraith writes to this effect: "And a large blue-collar labour force, especially if subject to the external authority of a union, introduces a major element of uncertainty and danger." (J. Galbraith. *The New Industrial State,* Boston, 1967, p. 236.)

regarded this as a sign of "transformation" of capitalism. But actually this phenomenon stemmed not from any change in the nature of capitalism but from the concrete socio-political conditions it was developing under.

The Second World War gave considerable impetus to the development of military technology based on the latest achievements of science. The first use to which the capitalist countries put the great discoveries of nuclear fission and nuclear fusion, was military in the form of atomic and hydrogen bombs. Advances made in the electronics industry led to the invention of radar, etc.

The scientific discoveries used in military technology could not but affect production for civilian needs. The development of military technology and scientific research for military purposes led not only to an accumulation of discoveries and inventions of military and commercial significance. These discoveries and inventions also strengthened the state-monopolies alliance which, after the war, assumed still greater proportions. The machinery of state-monopoly capitalism in that period was used still more for the promotion of scientific and technological progress. A major proportion of research expenditure (in the United States 2/3 of the total sum) is borne by the state. Through tax exemptions the capitalist state encouraged capital investment by the monopolies in new technology. A high level of development of science and technology heightens their economic effect and encourages the use of technological improvements.

With the general progressive changes that

have been taking place in the world, the acceleration of technological development is closely associated with the increasing influence of the working class on socio-economic and political processes. The gains secured by the working class in the field of social legislation and in the form of higher wages at various periods, have served as an important factor in the expansion of the domestic market. In addition to this, these gains by the working class have also induced the capitalists to continue replacing labour with profit-making machinery.

One of the reasons for a larger domestic market in the post-war period was a marked expansion in the non-productive sphere and the attendant demand for consumer goods, as well as for the electric power and various materials used for replacement and expansion of its basic assets. All these factors heighten the incentive to utilize the achievements of scientific and technological progress also in the non-productive sphere. At present the sum total of wages and salaries paid out in the non-productive sphere in the United States is bigger than that for material production. And the non-productive sphere also accounts for a majority of capital investments in basic assets.

Like many other processes, trends in science and technology should be viewed against the background of the great influence exerted by the socialist system on capitalism. It is specifically because capitalism is no longer the dominant social form of development of productive forces and has been forced to take up the challenge of world socialism that capitalism has displayed so much interest in the development

of science and technology and allows the state to interfere so actively in the economy. For example, the orbiting of the world's first artificial earth satellite by the Soviet Union on October 4, 1957, brought about a review of technical and engineering colleges in the United States where a number of new research programmes were launched.

A US Senate Committee report reads: "Comfortable assurances of American scientific superiority were shattered when sputnik went into orbit in 1957. Hurried inventories revealed that Soviet output of scientific and technical manpower exceeded our own." [1]

The development of science and technology is also promoted by inter-imperialist competition which has grown in intensity after the restoration and re-equipment of the industry of the capitalist countries of Europe (and Japan), and after the imperialist integration of Western Europe began. Some new industrial enterprises built after the war in Western Europe and Japan surpass even those in the United States. In addition to this, the monopolies of these countries take advantage of the lower wages of their workers and in this way become more competitive than the American monopolies both on their domestic markets and in some cases on the American market, too. [2]

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[1] *Toward Full Employment: Proposals for a Comprehensive Employment and Manpower Policy in the United States.* Committee on Labour and Public Welfare, US Senate. Washington, 1964, p. 10.

[2] An example is the automobile industry. In the first half of the 20th century the American automobile industry symbolized the industrial might and technical superi-

Thus, the economic and social conditions of the post-war period opened up great possibilities for putting science and technology to work within the framework of state-monopoly capitalism. By about the 1950s the important qualitative changes in the productive forces began to assume the character of a scientific and technological revolution.

Signs of change

Every important stage of development of the productive forces has had its own system of indicators which characterize the technical and industrial potential of society. The industrial revolution of the 18th and 19th centuries could be represented by the number of looms and the power produced by the steam engines. In later times the principal indicators were the output of coal, cast iron, and steel and electric power capacities.

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ority of the United States. At present, however, certain British, French and West German automobile manufacturers have surpassed the United States in modern technical standards. This, plus the lower wages and cheaper models, has enabled European manufacturers to overcome the customs barriers in the United States and make their way into the American domestic market.

Other examples are Japanese textiles which have seriously affected the textile industry in the New England states, and Japanese transistor radio sets which have flooded the American market.

The production of electronic computers which was, until recently, concentrated in the United States, is still another field where the Americans now encounter stiff competition from computer manufacturers in Britain and France which often join hands to keep the Americans out of Europe.

To characterize the present-day stage of technical advance a new system of economic indicators will have to be worked out.[1]

The amount of expenditure on research and design work could be one such indicator. The unprecedented rate of growth of such expenditure is shown by the amounts allocated in relation to national income. For example, in 1963, research accounted for the following share of the national product: in the United States—3.0%, in Britain—2.5%, West Germany—1.9%, and Japan—1.6%.

One of the most important directions taken by the scientific and technological revolution is the automation of production processes. Its spread can be illustrated by the increased proportion of expenditure on automation in the sum total of capital investments. In the American manufacturing industry, for instance, automation in 1955 accounted for 11% of the total sum of capital investments. In 1966 this figure rose to 20%, in 1968, to 25%, and in 1980 it is expected to rise to 30%.

The cybernetic stage of automation, when whole automated systems are operated through the processing of information by electronic computers, is gaining ground.

Computers are also used for information processing in such spheres as economic planning and control, for working out optimal economic solutions, and for processing current economic data used in the scientific management of production.

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[1] Soviet economist Y. Kvasha maintains that economic statistics should include an indicator for the application of electronics.

In many cases automation yields results faster here than in the sphere of production. It can exercise control, using information and calculations which were practically impossible to obtain before because of the long time it took to process them.

That is why computers, or "thinking machines", are being installed to process current information at banks, insurance companies, government institutions, and especially at military establishments.

The proportion of computer-processed information has become a leading criterion of economic progress. In 1970 the United States' stock of computers was about 70,000—far ahead of the West European countries and Japan.

One of the fastest developing branches of industry is the chemical industry, which accounts for the marked changes in its structure. In the 1960s the chemical industry in the United States grew almost twice as fast as the manufacturing industry. The total world production of plastics rose by almost 8 times in the period 1959-67.

The fuel-and-power balance has also changed greatly under the influence of the scientific and technological revolution. Oil and gas, for example, account for over 60% of the fuel-and-power balance of the United States, while in West Germany, Britain and France the figure does not go beyond 25-35%. The number of atomic power stations and the power they produce have also increased rapidly.

All these figures show that the technological revolution has had a marked effect on the forces of production in the capitalist countries. But

even in the most advanced of them, the instances of new technology born of this revolution are little more than incidental within a technological system which basically belongs to the machine stage of technological development. Therefore, the new tendencies born of the scientific and technological revolution are not always readily apparent, and often exist side by side with the old tendencies typical of the preceding stage of technological development.

Although the scientific and technological revolution is only in its infancy, its consequences have affected many aspects of life: employment, the division of labour, the training of personnel, the scientific organization of labour, the social structure of society, and the course of social conflicts. In addition it affects the structure of consumption, the character of family relations, recreation, and the appearance and planning of cities.

The production of goods has played the most important role in the development of society since the invention of stone tools. At present, however, the "production of knowledge" plays an increasingly important part. In international economic relations the export of knowledge in the form of patents, licenses and technical documentation is gaining in importance.

The high speed at which these changes are occurring results in collisions and problems arising from the adaptation of social institutions and traditions to new conditions. The new relations between man and the object of labour, between man and nature, between man and man, and also the modern way of life are determined more than ever before by our artifi-

cial environment which is a substantivized form of scientific and technological knowledge. The growing density of population, and the development of transportation and the mass media, expanding and intensifying contacts between people, are making our planet shrink rapidly.

The discovery of nuclear reaction has put man in possession of energy of tremendous power which can be used to create as well as to destroy. The revolution in weapons of war, with their threat of global destruction, has created a close interconnection between the technological revolution and international relations.

It is no exaggeration to say that the scientific and technological revolution has affected the whole of life.

The further development of the scientific and technological revolution will undoubtedly have still greater and more far-reaching social consequences.

Herein, it has to be remembered that the character of the social processes resulting from the scientific and technological revolution is largely determined by the social conditions of production. This means that, with the exception of a few purely superficial elements, the social consequences of the scientific and technological revolution under capitalism and socialism are vastly different.

2. THE ROLE OF MAN IN THE WORLD OF AUTOMATION

In the establishment and development of human society labour has played a vital role. The

automation and cybernetization of the economy have given rise to unique problems which affect the very foundations of human life. Present-day automatic systems can, without the direct interference of man and at great speed, do work which in former days required the efforts of hundreds of workers. The rapid growth of productivity as the result of the application of the latest advances in electronic and cybernetic technology, and the liberation of man from direct participation in the production process raises the question about his place in the world of automatons. A situation has been created where the growth of production hinges on the intensive use of manpower and its qualitative level and on the quantity of machinery available per worker. A good example of this is the considerable growth of industrial production in West Germany, Italy, and France in the 1960s along with a general decrease in the total number of wage and salaried workers engaged in industry.

Another illustration of this trend may be found in the oil-refining industry, one of the best automated in the United States, where in the period 1953-67 output rose by 58%, while the number of personnel was reduced by 23%.

But the most striking of all are the results of intensification registered in the agriculture of the advanced capitalist countries, with an attendant reduction of personnel engaged in production. In the countries of Western Europe, for example, farm production rose by 70 per cent while the number of workers dropped by more than a half: from 25 million in 1950 to 11 million in 1968.

In the course of the scientific and technological revolution the creation of material goods depends less and less on the direct application of human labour and more and more on the means of production, i.e. on the substantivized force of knowledge. The question arises of what place man will have in the production process when a considerable proportion of production is carried out by automatic systems.

In their studies on this problem some Western sociologists foresee the advent of an epoch of universal idleness. American economist R. Heilbroner writes in this connection: "It is no longer sheer fantasy to look ahead to the day when technology will present society with the gift of an immense wealth together with an equally immense vacuum of toil." [1] The authors of the notorious "Statement of the Ad Hoc Committee on the Triple Revolution" paint the future in much the same light. Some predict the moral degradation of man. The French sociologist Messadié goes so far as to ask: "Has man outlived himself?" [2]

The revolution in manpower—part of the scientific and technological revolution

These pessimistic prognostications about the future of mankind give a rather one-sided picture of the actual processes. Although, in a technically advanced society, the proportion of direct labour has diminished in relation to the amount of labour substantivized in the means of production, in the same way as the amount of labour per commodity unit has been reduced, one must not ignore the profound transformations in the content and division of labour. The point is that the technological revolution is closely associated with the revolution in the labour force itself. This revolution is not a mere result of the scientific and technological revolution, as it might seem, but is an active part of it. This revolution in the labour force is now at its formative stage, but it would be a mistake to underestimate its socio-economic and political significance.

In the first place, important changes are taking place in the content, functions and concrete forms of labour which have substantially modified the role of man in production. The application of scientific method to production, automation and the introduction of cybernetics have sharply reduced the executive and labour-consuming functions which are largely replaced by other functions, such as the organization and co-ordination of systems of control, technical servicing and improvement of technology and production. The role of man as the productive force of society is expressed not so much in his direct participation in the processing of the object of labour as in the creative processing of information in order to raise the intensity and efficiency of relations between man and nature. This creates prerequisites for the acceleration of scientific and technological progress and for the development of man himself—something which, for the first time, has become a standard requirement of the modern production process.

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[1] Bernard D. Nossiter. *The Mythmakers,* Boston, 1964, p. 137.
[2] *Science et vie,* mai, 1962.

These changes in the process of production can be illustrated by the following figures. The number of scientists in the advanced countries is doubled every ten years. The number of white-collar workers in the United States and Canada now exceeds the number of blue-collar workers. By the end of this century this will in all probability be the typical pattern for most of the advanced countries. The increase in the proportion of engineering, technical and office personnel in industry in the advanced capitalist countries has led to the fact that at present they account for about 25% of the work force, while in the newest industries born of the scientific and technological revolution, this figure is much higher. In the electronics industry in France 60% of the employees are engineers, technicians and office workers. In the atomic energy industry of the United States 20% of the employees are scientists and engineers and 58% come under the category of white-collar workers. In the American chemical industry white-collar workers amount to 41% of the employees.

Of the blue-collar workers the fastest growing group consists of skilled workers who in qualification approach technicians and engineers. In the United States, for example, in the ten years between 1950 and 1960, the number of skilled employees engaged in "setting up" automatic lathes and machines rose by 57%, the number of mechanics and repairmen by 31% and those employed in the automobile servicing industry by 159 per cent.

The development of machine production, especially at the stage of conveyor-belt mass production, was attended by a fragmentation of operations, by an increasingly narrow specialization of labour. The automation of production processes brings about new tendencies—towards the integration of operations, towards the expansion of areas serviced by one operator and towards the appearance of new, more complex and broader occupations. As a result, a tendency towards the universalization of professions begins to gain ascendancy over the former tendency towards specialization. In the United States, for example, the number of listed trades and occupations was reduced from 24,000 in 1949 to 21,700 in 1965.

Another characteristic feature of the revolution taking place in the work force is the latter's increased mobility. According to a poll conducted by the National Institute of Statistics in France, more than 4 million workers (20% of the working population of the country) changed their occupation or specialty between 1959 and 1964. In the United States various changes affect $11\frac{1}{2}$ million jobs and $8\frac{1}{2}$ million workers every year. Nearly 50% of these changes are caused by people leaving one industry for another and changing their trades and occupations, 20% by transferring to another industry in the same capacity, and only 8% of changes are connected with workers changing jobs within the same industry.

In West Germany, $7\frac{1}{2}$ million wage and salaried workers, (almost one-third of the working population) were forced to change their occupation or specialty over the four years between 1966 and 1970. It is expected that in the 1970-80 period another $10\frac{1}{2}$ million industrial and

office workers (about 50 per cent of the total work force) are expected to change their professions.

The population has also come to exhibit a high level of territorial mobility. In the period 1955-60 about 30% of the population of the United States changed their residence, 19% of this number having moved to other countries. The rate of migration is particularly high among young people and the unemployed.

It is worthy of note that the integration processes taking place within the framework of the European Common Market have accelerated the restructuring of the economies of the countries of Western Europe and given added impetus to the inter-industrial and territorial migration of the work force.

As the result of the inter-industrial mobility of capital and the work force, a new economic structure has been taking shape, and a new composition of the work force has emerged, which is not only the result of the burgeoning scientific and technological revolution but also an important condition for its further development.

Non-productive branches in the lead

At this stage in the scientific and technological revolution, the shifting proportions of employment are largely responsible for the rapid expansion of the non-productive sphere, with its far-reaching economic and social consequences. In the advanced capitalist countries the proportion of the total working population engaged in

the general sphere of services grew from 31% in 1950 to 41.5% in 1968. This rise was particularly marked in the United States, where between 1950 and 1968 the number of people engaged in the non-productive sphere grew from 22.7 million to 39.9 million. The proportion of wage and salaried workers in the non-productive sphere grew in the same period from 50.2% to 58.8%.

This shift in the distribution of the working population became possible as the result of the growing productivity of labour in the sphere of production. In his study of the census returns for Britain in 1861, Karl Marx pointed out that rapidly increasing labour efficiency in large-scale industry made it possible to employ an increasing section of the working-class population in non-productive fields. At that time Marx ventured to predict that the productivity of labour would eventually be raised to such an extent that fewer workers would be engaged in the sphere of material production than outside this sphere. [1]

Now this prediction has become a reality. The United States has become the first country in the world where more people are employed in non-productive branches of the economy than in the productive branches. It is expected that by 1975 about 62% of wage and salaried workers will be employed in non-productive branches.

In the countries of Western Europe the proportion of the working population employed in

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[1] K. Marx, F. Engels. *Works*, Vol. 26, part I, pp. 205, 206, 215, Russ. Ed.

the non-productive sphere grew from 31.9% in 1950 to 37% in 1968. In Japan the figures are 29.5% in 1955 and 35% in 1967.

The expansion of the non-productive sphere is not only the result of rising labour productivity in the sphere of production but is, to a certain extent, its cause. This applies primarily to scientific institutions, to public education and to the public health service.

At the present stage of development of capitalism the expansion of the non-productive sphere depends on the rising productivity of socially useful labour and on the development of still more varied services. At the same time it is also determined by sales difficulties, the increase in the military and police apparatus and by the growth in the parasitic requirements of the capitalist class.

Some Western economists regard the expansion of the non-productive sphere as some sort of social upheaval which will eventually obliterate the economic and social contradictions of capitalism.

These concepts, however, stand on very shaky ground. Trade, the credit-and-finance system, public education, the public health service, public entertainment and the various public services form, together with the sphere of production, one single process that is the capitalist economy. And operating in the non-productive sphere are the same laws and contradictions of capitalism as operate in the sphere of production.

The capitalist non-productive sphere is noted for its great social diversity, for its low level of socialization, and for the large proportion of

small business in some of its branches as compared with the sphere of production. This difference decreases as the large corporations expand their operations in the servicing industry. Such branches of the non-productive sphere as trade and public services are noted for employment instability, lower wages and inferior working conditions compared to the sphere of production. As a result, recent years have seen strikes in the non-productive industries grow in intensity.

The non-productive branches have also absorbed workers who have been displaced from the sphere of production as a result of technological progress. But mechanization and automation have now penetrated into the non-productive sphere also. It might be expected that this process would impede the growth of employment in these branches. But, considering the fact that automation can be applied here only on a limited scale, and in view of the substantial changes in the structure of consumption and the rapid rate at which new needs arise (in public education, tourism, recreation), the chances are that in the future employment in the non-productive sphere will continue to grow.

In all capitalist countries other than the United States, industry still employs most of the available work force. Changes in the sectoral structure of employment as a rule follow the changes in the sectoral structure of production. It should be noted here, though, that because of the irregular rate of growth of labour productivity in the various branches of industry, the changes in the branch structure of employment

do not fully correspond to the changes in the branch structure of production.

The structural changes in industry are marked in particular by the priority growth of three branches—the power industry, the chemical industry and the machine-building industry—which play the decisive role in today's scientific and technological revolution. Employment in these branches is on the whole growing considerably (though not as fast as production and capital investments). In the United States the proportion of industrial and office workers in the machine-building and chemical industries against the total number of workers employed in manufacturing rose from 33% in 1947 to 40% in 1965. In the Federal Republic of Germany the proportion of those employed in the machine-building industry (including metal working) and the chemical industry (including oil refining) rose from 31% in 1936 to 45% in 1960.

The situation at the present stage of technical progress, with its concentration and centralization of capital, leads to the industrial specialization of production which reflects the growing rate of socialization of labour. The old branches are "split up" into new industries which are based on the recent important discoveries in science.

Knowledge replaces manual power

Changes in the content and division of labour and in the composition of personnel operating modern machinery enhances the objective role

of education and professional training. Whereas previously the average worker needed mostly physical stamina, and to be able to read and write, modern technology requires that the worker with machines have a knowledge of mathematics, physics, chemistry, and the strength of materials, the ability to read working drawings, and an understanding of the design principles of complicated mechanisms. Specialized education has thus become the foundation of this new type of qualification, and the attitude of capitalists to public education has changed accordingly. The well-known dictum of Henry Ford, Sr., to the effect that he did not care who came to him asking for a job, a Sing-Sing jailbird or a Harvard graduate, sounds hopelessly obsolete. Many factories, and especially in new industries, do not accept applicants without a secondary education. Big companies often recruit specialists straight from college, and have lately even been importing them from other countries.

Since higher and specialized education is becoming increasingly important for the training of the industrial work force it has a direct bearing on labour productivity and the growth of the national income. It goes without saying that specialized education is not an independent factor of production, but if combined with other conditions of production, it becomes more and more important.

According to Prof. E. F. Denison, the well-known American economist, higher standards of formal education were responsible for 40% of the growth of per worker output in 1929-57,

while the growth of per worker investment in machinery supported a much lower figure.

The acquisition of knowledge necessary for work requires a much greater expenditure of time and effort on the part of students and instructors than before. Higher education itself is becoming a major field of application of skilled hired labour which performs an important economic function.

In the post-war period there has been a tendency towards a longer period of education at secondary school. By making a later start on their independent life young people have thus lowered the proportion of the employed able-bodied population. In the United States this factor has caused, for the first time in this century, the average period of working life of the male population to decline from 41.9 years in 1950 to 41.4 years in 1960.

The longer period of education has not only decreased the potential salary of a working family by the fact that grown children now begin their working life somewhat later than before, but also gives rise to additional expenses. All this leads to an increase in the overhead for the work force. As a result of the new significance of higher and specialized education the cost of education is rising, thus becoming an important element in the cost of production and reproduction of the work force.

The total cost of education is increasing faster than the increase in the national product and the national income. The proportion of the cost of education in the national product of the United States rose from 3.3% in 1950 to 5.5% in 1963, and the proportion in the national income from 4.5% to 8.6% over the same period. The cost of education in relation to the total amount of capital investments over this period almost doubled.

For the first time the outlay on the "intellectual" equipment of labour has become commensurate with the direct outlay of capital per worker. In the American manufacturing industry these investments formed the following pattern (1960 figures): cost of basic assets per worker—5,360 dollars; cost of education per worker—4,560 dollars. These figures show the growing economic role of the "human factor" of production. Hence the much closer interest in the planning of education and professional training, in making them more effective, and in problems involving the rational use of labour resources.

Research in this field shows that the cost of education for the working population as a whole is increasing at a faster rate than the national wealth of the country. Thus, between 1929 and 1957, the average annual rate of growth in the cost of education for the working population of the United States was 4.09% (in terms of 1956 prices), while the national wealth increased by only 2.01%.

The marked growth in the economic role of public education has dealt a severe blow to capitalism's concept of capital as an aggregate of means of production. Some Western economists have recently propounded a theory of "human capital" according to which investment in education is a money-making proposition and is not to be classed as consumption. These theoreticians have "discovered" what Karl Marx

knew a long time ago, namely, that outlays on education are to be included in the cost of the reproduction of the work force (which is a constituent part of the reproduction of capital), and that scientific knowledge itself is an important force of production.[1] However, capitalist economists put an entirely different meaning into their theory of "human capital". According to this theory, the worker invests capital in himself in order to collect dividends in the form of higher pay. This theory blurs the class antagonism which lies at the bottom of relations between labour and capital. The theory is an attempt to rejuvenate the bankrupt theory of "people's capitalism". A leading exponent of the theory of "human capital", T. Schultz, puts this interpretation on the process: "Labourers have become capitalists not from a diffusion of the ownership of corporation stocks, as folklore would have it, but from the acquisition of knowledge and skill that have economic value."[2]

The economic implication of public education can be fully understood only on the basis of

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[1] Marx pointed out that the accumulation of knowledge and the development of man's abilities should be regarded as the creation of capital. "Saving the worker's time is tantamount to increasing his free time, i.e. the time necessary for the fullest possible development of the individual, which, being the greatest productive force, retroacts on the productive force of labour. From the point of view of the immediate process of production, the saving of working time can be regarded as the production of basic assets, its role being played by man himself." (K. Marx, F. Engels, *Works*, Vol. 46, part 2, p. 221, Russ. Ed.)

[2] *Economic Growth*. Ed. by Peter M. Gutmann, Englewood Cliffs, N. Y., 1964, p. 127.

the Marxian labour theory of value. "All labour of a higher or more complicated character than average labour is expenditure of labour-power of a more costly kind, labour-power whose production has cost more time and labour, and which therefore has a higher value, than unskilled or simple labour-power. This power being of higher value, its consumption is labour of a higher class, labour that creates in equal times proportionally higher values than unskilled labour does."[1]

The higher the education of a worker, and thus the higher his production skill, the greater is the efficiency of social production as a whole. But in the conditions of the capitalist mode of production the advantages from this increased efficiency are turned into surplus value, extracted and pocketed by the capitalist in the form of increased profit on capital. The higher pay of a more qualified worker is merely partial compensation for the higher value of his labour.

These are manifestations of the cardinal changes in the sphere of labour and occupational training, changes which are as yet in their incipient stage. These changes, however, herald not the alienation of man from work in general but the liberation of man from arduous, monotonous physical work, and his liberation from blind subservience to the machine. Modern technology, and especially the technology of the near future will rely more on the intellectual and creative abilities of man and less on his physical strength. More importance will be attached to technical invention, to dissemination

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[1] K. Marx. *Capital*, Vol. I, p. 197.

of knowledge and to man's spiritual and cultural requirements. All this means that the scientific and technological revolution denotes not the deterioration of man but, on the contrary, his advance, an unprecedented development of his intellectual and creative potential.

Thus, the cardinal changes in the sphere of labour have important economic and social consequences. While raising the efficiency of social labour these changes also exacerbate the contradictions of modern capitalist society, creating a crisis in the relations between hired labour and capital and a crisis in the traditional methods of industrial management and personnel training.

3. SHIFTS IN THE SOCIAL STRUCTURE OF CAPITALIST SOCIETY

Alongside the constant changes in the productive forces and production relations under capitalism, considerable changes are taking place in its social structure. Whole classes and social groups are disappearing—for example, the old landed aristocracy. At the same time certain other social categories, such as the scientific and technical intelligentsia, the managerial hierarchy of the corporation and the state, and office employees are expanding rapidly, all of which has caused some sociologists to speak about the emergence of a "white-collar society".

Today's scientific and technological progress has wrought important changes in the socio-

economic position and role of the various classes and social groups, all of which has given rise to a number of important problems. Various questions present themselves. Do the main classes typical of the capitalism of the 19th century still exist in the modern "industrial state?" And if they do, what is their composition and what is their social role at the present time? Was Marx right when he spoke of the decisive role of the proletariat in the revolutionary transformation of society?

Classes or "strata"?

In the last century the question of the division of society into classes was hardly ever disputed. But now, sociologists deny the existence of classes in the modern "industrial society", and instead talk about the emergence of a society of "social harmony" and "partnership" where there are no longer any grounds for class struggle.

While denying the fact of the division of capitalist society into antagonistic classes, Western sociologists have advanced various concepts about the "stratification" of the "former" classes. The protagonists of the "stratification" theory attempt to prove that the "modern industrial society" is not a class society but a stratified one in which a multitude of strata reflect a variety of factors: size of income, way of life, level of education, religion, race, etc.

There is no denying that a common religion or ethnic group, or a common educational level may be the basis of a community of individuals.

But the fact is that people are distinguished from one another on entirely different lines when it comes to their vital interests. The history of more recent times offers many examples of unification of people of different religious persuasion (and of believers and non-believers), and of people belonging to different races and to different ethnic groups—mass action taken in defence of their democratic and social gains. At the same time both the interests and living standards of a Protestant member of the Ford family and a Protestant worker employed by Ford are poles apart.

Any arbitrary choice of criteria for the definition of "strata" makes it possible to group and re-group the population at will. Moreover, the subjective opinion of any person about his social status is often taken as the basis for the definition of such a group. The theorists' whole concept of "strata" is vague and ill-defined and cannot be taken seriously as the basis for scientific analysis of social processes.

In the theory of "stratification" the social structure of society has no objective basis. Meanwhile the very emergence and development of classes stems from the concrete conditions of the material life of society. The creation of material values has always been a social process. In the course of this process of production people enter into certain production relationships whose character is changed with changes in the mode of production. Classes are the product of these relationships at certain stages of historical development of society.

A correct definition of classes is of great importance to the understanding of the substance

of social processes. What are classes, and what are their basic characteristics?

Lenin gave the following definition of classes:

"Classes are large groups of people differing from each other by the place they occupy in a historically determined system of social production, by their relation (in most cases fixed and formulated in law) to the means of production, by their role in the social organization of labour, and, consequently, by the dimensions of the share of social wealth of which they dispose and the mode of acquiring it. Classes are groups of people one of which can appropriate the labour of another owing to the different places they occupy in a definite system of social economy." [1] These main characteristics largely define other distinguishing features of classes and social groups : level and nature of education, sphere of activity, place in the political organization of society, specific features of ideology and psychology. Modern capitalist society is divided into two basic classes—the working class and the capitalist class (the bourgeoisie).

Of course, social classes are not made up of a homogeneous mass of people who fit a certain standard. Various social groups and divisions take form within the classes themselves. These groups may be distinguished among themselves by virtue of their activity, mode of life, views, etc., which however, do not prevent people from uniting in defence of their basic class interests.

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[1] Lenin. *Coll. Works,* Vol. 29, p. 421.

The social structure of society is not limited to the main classes only, for society also includes smaller classes some of which are the remnants of former social formations.

The Marxist-Leninist concept of classes and class struggle makes it possible to uncover objective laws in social life, and to foresee events and exert an influence on them by way of the conscious, mass activity of the people.

Recognizing the decisive significance of the class struggle and class interests in social development Marxism at the same time takes account of the multitude of factors which influence the development of society, including national and religious distinctions, the role of the individual, specific historical features, national traditions, and ideological and psychological aspects.

The main classes of capitalist society—the bourgeoisie and the proletariat—came into existence back in the days of feudalism. Their later development is inseparable from the development of capitalist production.

Reproduced in the course of capitalist production are not only capital in material and monetary form, but also the production relations of capitalism. The starting point of capitalist production—the separation of the means of production from the producer and their transformation into capital—is being constantly reproduced by the very mechanism of the capitalist mode of economy. "As simple reproduction constantly reproduces the capital-relation itself, i.e., the relation of capitalists on the one hand, and wage-workers, on the other, so reproduction on a progressive scale, i.e., accumulation,

reproduces the capital-relation on a progressive scale, more capitalists or larger capitalists at this pole, more wage-workers at that." [1]

Some apologists of capitalism point to changes in the distribution of profits at capitalist enterprises as proof that there has been an "incomes revolution" which has allegedly toppled the former class structure and created a uniform middle-class society. It is true that the living standards of the working population have risen, thanks to the favourable economic situation after the war, as compared to that in the pre-war period, and also as the result of the higher wages and social security improvements wrested by the working people from their capitalist employers. But from the point of view of class relations, it is not only the absolute level of wages that is important but also their proportionate distribution. Here, no revolutionary changes have taken place. The statistics of profits and incomes in the United States show that 40% of families in the lower income bracket accounted for a mere 16.8% of all personal incomes in 1947. Twenty years later this proportion had changed but very little and stood at 17.6%.

Of no less importance are the qualitative distinctions in the different income brackets. The main source of income for the payer in the low-income bracket is his wages in exchange for his labour which he sells to the capitalist. In the United States, the wages and salaries of taxpayers in the two lowest income brackets, accounted in 1967 for about 90% of their total

[1] K. Marx. *Capital,* Vol. I, p. 613.

income, and dividends for about 1%. Tax-payers with a higher income derive it mainly from dividends and from the sale of securities, that is, they derive it, ultimately, from the exploitation of hired labour. For the two top groups (with an annual income of more than 500,000 dollars) these sources accounted for 89% and 94% respectively of their total income. Thus the difference remains, not only in the incomes but also in their distribution on the basis of the capitalist relations of the exploitation of hired labour.

The division of society into antagonistic classes remains the objective reality of the modern capitalist world. The changes that have taken place in the productive forces and production relations under capitalism have not changed the nature of the principal classes. They have, however, induced major changes in the socio-economic position of these classes, and in the entire social structure of capitalist society.

The development of science and technology today is proceeding not in an abstract society, but under concrete social, economic and political formations which in many ways determine the direction, rate and consequences of scientific and technological progress. At the same time profound qualitative changes in the productive forces have created the necessary conditions for drastic changes in relations between people in the course of production (production relations). With the existence of antagonistic class formations these changes take place by way of revolution and lead to the replacement of the outgoing mode of production with another, more progressive mode of production. But even

within the duration of a given mode of production there may be certain changes in production relations which do not affect their essence and which are reflected in changes of the social structure of society. These changes occur mainly under the influence of scientific and technological progress.

The evolution of the bourgeoisie

The completion of the industrial revolution in the 19th century and the rapid growth of the textile, iron and steel and machine-building industries on the basis of private capitalist enterprise led to the formation of a group of powerful bourgeoisie within capitalist society. The leading role in that period was played by industrial and banking capital.

Transition to the monopoly stage of capitalism was accompanied by the formation of a qualitatively new kind of capital—finance capital—which quickly dominated the capitalist economy. At the same time the hierarchic structure of the bourgeois class took form, with the financial oligarchy at the top. Aided by the system of monopoly control over the corporations, this oligarchy seized the key positions in the economy.

The financial oligarchy includes individuals with tremendous fortunes, the multi-millionaires and billionaires who control the biggest corporations. Despite the tireless efforts of Western propagandists to try to make out that as a result of high taxes and private contributions to charity, the really big accumulations of wealth have either diminished or been dissolved, in ac-

tual fact they have grown still bigger. A study of the wealth of America's richest families over the past 35 years shows that their capital has in most cases greatly increased. The fragmentation of large fortunes among heirs and its diminution by taxation is avoided or minimized through clever methods of management of capital and intricate ways of concealing profits and property.

The growing caste of financial magnates has been joined by the newly rich, people who have acquired great wealth over the past 20 years. Many of this class owe their new wealth to the achievements of scientific and technological progress, to profitable spheres of investment in new industries—and especially in arms manufacturing. In the United States one-third of the new millionaires made their fortunes in oil and gas (Getty, Callan, Hunt, and others). An important role in the growth of old and newly acquired wealth was played by the state-monopoly methods of enrichment.

Great as the personal wealth of the financial magnates is, it is as nothing compared with their actual power, which is based also on their domination of other capital through the controlling stock which they own. In the middle of the 1950s, the Rockefeller family controlled 17 times as much capital as their own personal wealth, the Du Ponts controlled 3.5 as much as they themselves owned, and the Mellons 3 times as much.

A high rate of concentration of capital is a necessary prerequisite for introducing new machinery into production. Only the powerful monopolies which derive enormous profits and

which enjoy virtually unlimited credit at the largest banks can mobilize the amount of capital necessary for the adoption of modern technology. Again, only the monopolies have at their disposal research laboratories and a large staff of skilled engineers and technicians to run their modern plants.

For the same reason scientific and technological progress, in its turn, stimulates the concentration and centralization of capital.

With the growth of large-scale production its advantages increase, though not indefinitely. After a certain point the advantages of large-scale production are neutralized by the prohibitive cost of management overheads, higher administration expenses and transportation costs, and the higher cost of long-term designing, construction and development of new industrial projects. In some cases the largest industrial establishments bring in lower returns than certain medium-sized, specialized and technically well-equipped establishments.

Transition to the cybernetic stage of automation has increased the advantages of centralized control and accounting.

Rapid scientific and technological progress has accelerated the process of the absorption of small and medium-sized enterprises by larger industrial establishments equipped with modern, highly efficient machinery. The introduction of the latest machinery is often attended by the centralization of production. Having automated its production process, the Ford Motor Company, for example, began manufacturing many of the parts and units that had previously been bought from "independent" manufac-

turers, as a result of which the latter ceased to exist. In this way Ford took over the production of car bodies and stampings, the casting of cylinder blocks, and the manufacture of automatic transmissions, carburettors, heaters and wheels. An American authority on automation, Professor Walter Buckingham, in a statement before a Congressional committee, said: "In many industries automation adds its weight to other economic forces destructive of small enterprise." [1]

The period of technical re-equipment of production is noted for a record number of mergers. In the United States there were 14,453 mergers in 1965-69—considerably more than in all the previous post-war years. In Britain the average annual number of mergers grew from 292 in the period 1954-58 to 794 for the period 1960-69.

The number of mergers in the new industries and industries which play a decisive role in the design and manufacture of modern technology has been particularly large. The merger process has affected mainly large establishments, connecting those of many different industries and leading to the creation of large industrial complexes which unite various unconnected enterprises. Computers and long-distance communication lines have become a convenient medium for the centralization and spread of monopoly control over a large group of multifarious industries and services thousands of miles apart.

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[1] *New Views on Automation.* Joint Economic Committee. Congress of the US, Washington, 1960, p. 75.

The present stage in the development of capitalism is notable for the creation of giant multiple concerns—scientific-industrial, trade-industrial and agrarian-industrial complexes. The monopolies take advantage of the expanding contacts between agriculture, on the one hand, and the market, banks and industry, on the other, and seek to subjugate small enterprises. The system of "vertical integration", depriving farmers of their economic independence is becoming prevalent. Agriculture is becoming increasingly dependent on the magnates of finance capital.

At present, joint stock companies, or corporations, are becoming the dominant organizational form of capitalist production. In 1965, they accounted for 98% of the gross profit of the manufacturing industry, 93% in the case of the electric power industry, transport, communications, and gas supply, and 87% in the case of the mining industry.

The large corporations are integrating science and production, and are combining and diversifying production. Monopoly corporations have entrenched themselves in branches of the economy which, until recently, were dominated by independent (mostly small and medium-sized) concerns. This process has been taking place in agriculture, commerce and in the servicing industry.

The scientific and technological revolution is also responsible, to a certain extent, for the fact that the process of the concentration of production and capital is transcending national boundaries. Out of 200 large American corpora-

tions, 80 conduct 25% of their business abroad. Many large West European and Japanese corporations (*Lever Brothers, Imperial Chemical Industries, Toyota, Datsun*) no longer operate on their national territories only, which points to the intensified internationalization of capital. Direct private capital investment of the United States abroad increased roughly 5-fold between 1950 and 1967 (by ten times in the advanced capitalist countries).

The industrial affiliates of American companies in Europe produce 65 thousand million dollars' worth of goods a year, which is 5.5 times more than the total volume of American exports to Europe. For their part, European companies in the United States manufacture goods to the value of 50-70 thousand million dollars. All foreign divisions of American companies (the third industrial power, as the French sociologist Servan-Schreiber called it) manufactured 140 thousand million dollars' worth of goods in 1969—more than the national income of any capitalist state apart from the United States itself. Experts predict further internationalization of business activity and also a further growth of international giant corporations.

An important aspect of the adaptation of the production relations of capitalism to the conditions of the scientific and technological revolution is the further growth of state-monopoly capitalism. After the war the state, in the leading countries of capitalism, largely determined the rate and direction of scientific and technological progress. It did so by financing research and development, encouraging private investment with privileged crediting arrangements and tax exemptions, and by expanding state investments.

As a result, the purchase of commodities and services by the state, plus government investments, account in various capitalist countries for 20-50% of the national product. In Britain, France and Italy the state controls between 30% and 40% of the national wealth.

The productive forces of modern capitalist society are steadily outgrowing the limits of individual capitalist property. The stock-holding companies which came into being last century hastened the process of accumulation and concentration of capital. At the same time they led to the separation of capital as property, from capital as function. At present most of the forms of capitalist property (stock-holding companies, government stock) go to show that capital as property has been completely separated from the function of management, which has been delegated to hired personnel.

With the tremendous concentration of capitalist property, the growing separation of the ownership of capital from its application and with the transformation of the entrepreneur into a financial capitalist, the role of the bourgeoisie in the social process of production has also changed.

The owners of corporations no longer take a direct part in the management of production. The dominance of finance capital increasingly separates the finance oligarchy from direct participation in the production process, providing further evidence of the uselessness of the bourgeoisie for social production. The magnates of

capital who make enormous profits from the vast financial complexes under their control often have only the vaguest notion of where their money comes from.

Another aspect of the process of separation of capital-as-function from capital-as-property, which is particularly noticeable in the epoch of monopoly capitalism and concentration of control in the hands of the financial oligarchy, is the inflation of administrative staffs headed by managers who enjoy economic power and broad authority in matters regarding the disposal of capitalist property.

The growth and increasing importance of well-trained administrative personnel who have fully assumed the managerial functions at large corporations have been studied by economists and sociologists. Some regard this development as a profound transformation of the institutions of capitalist society, as a result of which control over capital has passed from its owners to a new social group, the managers. The idea of the "managerial revolution" was first expressed by A. Berle and G. Means as far back as the 1930s. [1]

Now the ideologists of the "post-industrial" society are trying to revive these ideas. The well-known American sociologist Zbigniew Brzezinski maintains that the United States is no longer a plutocratic-oligarchic society but is becoming a "meritocratic democracy". [2] According to J. Galbraith, the gradual transition of

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[1] A. Berle, G. Means. *The Modern Corporation and Private Property*, N.Y., 1932.

[2] *The New Republic*, December 23, 1967, p. 21.

corporate authority from the owners of capital to the managers (the technostructure) makes for an identity of interests of individual corporations, the industrial structure and society as a whole.

The protagonists of the theory of the managerial revolution take only the external, obvious aspects of the actual process. In reality control over capital is slipping away from the mass of small shareholders and becoming even more concentrated in the hands of the principal owners. The separation of control from capitalist ownership does not at all mean that managers enjoy complete autonomy. In practice the prerogatives of the manager extend only as far as the interests of the owners who are in actual control of the corporation allow. The many and varied factors that energize the "technostructure" all operate to ensure a maximum capitalist profit under the given conditions, regardless of the consequences for society.

Both the size of their remuneration and the social prestige of the top executives hinges on the competitive power of the corporations they manage and on the profits they fetch. As a new social group of the "industrial society" they are part of the world of wealth. The salaries of top executives exceed several times over those of skilled engineers, and they have sufficient means to live in the style of capitalists of substance. Many of them have considerable stockholdings. According to the American sociologist Wright Mills, 45% of the administrative personnel of US corporations were shareholders in 1952. At the same time only 1.4% of the semi-skilled workers employed by these corporations were in pos-

session of industrial stock.[1] A similar situation obtains today. The top managers are in effect part of the monopoly bourgeoisie controlled by the finance oligarchy.

The growing importance of science, public education and culture adds to the importance of intellectuals and calls for an increase in their number. But regardless of their role in life, their independence is limited by the limitations of a class society, and their activity is controlled, ultimately, by monopoly capital. All research work financed by big corporations is geared to profit-making. And the more equipment, and the better, that a scientist uses in his laboratory, the more he finds himself in the grip of capital.

The growth of monopoly capitalism into state-monopoly capitalism, the strengthening of executive power, the expansion of the economic and social functions of the state, in addition to its coercive functions, give rise to a big growth of the state apparatus. The employees of government offices now form a large proportion of the working people. The vast majority of them hold a subordinate position in the power hierarchy, with decision-making powers being limited to a small group of top officials. In the early 1950s only 1,500 officials, out of the 2 million state employees in the United States, had a say in the affairs of the state. They wield political power which is backed by the growing military, police and administrative apparatus of the country.

The mounting aggressiveness of imperialism,

[1] C. W. Mills. *The Power Elité,* N.Y., 1957.

the rising military budgets and the growing armed forces equipped with weapons of mass annihilation all go to give greater power to the military. This process is especially noticeable in the United States, where, before the Second World War, the military played an insignificant role. The increase in the number of American troops, large numbers of whom are stationed outside the United States, is a direct consequence of the US objective to suppress the world-wide liberation movement. The pernicious influence of the military on the domestic and foreign policy of the United States grew steadily as a result of the "dirty war" in Indo-China which lasted for many years.

The question suggests itself as to what extent and in what manner the three centres of power—economic, political and military—are connected.

It would be an oversimplification to think of the separate groups of finance capital as being all-powerful in the making of political decisions. To take this approach would be to underestimate the role of political power. At the same time one cannot agree with the "power elité" concept advanced by Wright Mills in which economic magnates, government officials and top military men play approximately equal roles, and where the strengthening of state and military power in the interests of the financiers and monopolists is ignored.

Backed by the corporate and state bureaucracy, monopoly capital has firm hold of the key economic positions. Even so, the monopolies still do not control the entire economy. Some industries and services are controlled by non-

monopoly groups and medium-ranking capitalists. While exploiting the labour of others this capitalist class is at the same time compelled, through the mechanism of monopoly prices, to hand over part of its profits to the monopolies. Hence contradictions arise between the monopoly and non-monopoly groups. Sharp contradictions also divide individual groups of the capitalist monopolies.

Development of the proletariat

The proletariat has always been the class directly opposed to the bourgeoisie, which however, cannot exist without it. The two classes form a unity of opposites.

Changes in the technology and methods of production, major shifts in the social division of labour, and the spread of capitalist relations to new areas of activity have a profound effect on the size and composition of the proletariat, which is the principal productive force in capitalist society.

In the post-war period the rising rate of capital accumulation, its concentration and centralization, and the consolidation of the position of the powerful capital interests in new spheres of the economy have intensified the process of proletarization of the working people and consolidated the dominant capitalist forms of hired labour.

The opponents of Marxism ascribe to it the idea of complete proletarization of capitalist society. Yet, this bowdlerized approach is alien to Marxism. It is obvious that alongside the po-

larization of society, capitalism also calls into being a host of small enterprises (in the services and in industry) which are appendages of large corporations, increases the numbers of the professional class, the number of government employees, etc.

Although these "middle strata" occupy an important position in the social structure of capitalist society, their composition differs greatly from the "middle strata" of the last century when they were mostly represented by the peasantry. At present they are mostly represented by the city population.

One of the largest sections of the middle urban strata are the petty city bourgeoisie (artisans, craftsmen, small entrepreneurs in industry, commerce and servicing). In the middle 1950s they accounted for 15% of the population of France and 11% of that of the United States.

But the prevalent notion about the vitality of the small-time entrepreneur is nothing but fiction. The intensifying process of concentration and monopolization of production and circulation is attended by the crowding out of the small producer, which is evidenced by the shrinking proportion of small establishments, their falling profits and their increasing dependence on large capital. Frequently the small business folds up and the owner is forced to become a hired hand. His place is taken by new fortune seekers. There are even times when the absolute number of small-time entrepreneurs goes up, partly as a result of relative overpopulation. However, on the whole, in the epoch of monopoly capitalism the position of the petty

bourgeoisie has changed greatly, for it has become the most unstable, fluid section of the population, largely dominated by the big capital interests.

Thus, with these changes in the productive forces and the production relations of capitalist society wrought by the scientific and technological revolution, the principal tendency of capitalism towards social polarization, towards wider application of hired labour through buying and selling is growing markedly.

In the period between 1950 and 1968 the number of people engaged as hired labour in capitalist countries rose by 34%. Whereas before the Second World War the number of hired hands in some of these countries accounted for less (Japan) or a little over 50% (Italy and France), of the active population, hired labour in all the advanced capitalist countries now makes up most of the gainfully employed population (see Table 1). The proportion is particularly high in the countries where the proportion of the farming population is small (Britain and the United States).

What are the main sources of increase in the army of hired labour?

One source is the natural growth of the population. However, because of the comparatively low birth rate, and certain factors which tend to reduce the total number of people gainfully employed, natural growth cannot fully meet the increased demands of the developing capitalist economy for labour. In Britain the size of the gainfully employed population rose, in the years 1954 to 1964, by an annual 0.6%, and over the succeeding six years by only 0.25%. The natural

Table 1

Number and proportion of hired workers in the gainfully employed population

Countries	1950		1960		1968		Notes
	Number (millions)	%	Number (millions)	%	Number (millions)	%	
USA	48.3	80.5	56.1	80.4	68.6*	85.0	*Estimate for 1967
Canada	4.0*	75.8	5.3*	80.7	6.7	84.8	*Figures for 1951 and 1961
Federal Republic of Germany	15.9	71.0	20.9*	78.0	21.8	81.6	*Including data on West Berlin (1961)
France	13.4*	65.4	13.6*	68.9	15.2	76.0	*Figures for 1954 and 1962
Italy	11.6*	56.0	13.4*	66.3	12.8*	64.6	*Figures for 1951, 1961 and 1967
Britain	19.9*	88.1	21.9*	89.0	22.4*	90.0	*Figures for 1951, 1961 and 1966
Japan	14.0	38.6	23.6	53.6	28.9*	59.8	*Figure for 1965

growth of the population is expected to meet only 50 per cent of the future demand for labour of the British economy. In the Federal Republic of Germany the size of the total working population is expected to diminish between 1965 and 1975. Even in the United States, where the natural population growth is higher than in most of the other advanced capitalist countries, the rise in hired labour is far ahead of the rate of growth of the able-bodied population. In the period 1950-67, for example, the able-bodied population grew by 25%, while hired labour increased by 35%, 46% of which represented non-agricultural workers.

The more rapid growth of hired labour as compared to the rate of growth of the able-bodied population points to the intensified proletarization of working people. In the conditions of the scientific and technological revolution the machine of state-monopoly exploitation engulfs or otherwise destroys ever new contingents of former small businessmen of town and countryside.

The following figures provide a clear picture of the sources of hired labour, using the USA as an example.

The total number of industrial and office workers rose by 20.8 million between 1950 and 1967. But according to the growth rate for the entire working population this group should have increased by only 11.3 million. Consequently, the number of wage and salaried workers in the non-agricultural branches actually rose by an additional 9.5 million at the expense of other categories of the able-bodied population.

Table 2

Sources of the growth of hired labour in non-agricultural branches of the US economy for the period 1950-1967.[1]

Reduction of the numbers employed in agriculture	5 million
Reduction of independent job-holders and supplementary income earners in the family in non-agricultural occupations	2.5 million
Reduction of the non-gainfully-employed population	1 million
Reduction of the unemployed	1 million
Total	9.5 million

It will be clear from Table 2, that the flow of labour from agriculture to other branches of the economy is an important source of replenishment of the proletariat. This process, whereby hundreds of thousands and even millions of small and medium farmers are ruined and crowded out of agriculture has assumed unprecedented proportions due to the scientific and technological revolution and to the direct interference of the monopolies in this sphere. From 1940 to 1960 the number of farms in the United States was reduced by almost half. From 1959 to 1966 the number of farms was reduced from 4.1 million to 3.3 million (the number of farms valued at up to 5,000 dollars from 2.6 million to 1.8 million). Nevertheless, the poorest farmers continue to be a large source of overpo-

[1] The difference between the hypothetical growth of all categories of the able-bodied population (25% for the seventeen years) and the actual changes in the categories indicated. Calculated from data in the *Handbook of Basic Economic Statistics. Manpower Report.* April, 1968, p. 213.

pulation in agriculture. As of mid-1965, 33% of farmers were classified as being below the poverty line. Farmers account for 43.4% of all the poor of America. The average farmer's income is only half that of city-dwellers.

It is noteworthy that the majority of those leaving the land are 18-29 years old, which seriously upsets the normal age structure of the agricultural population. As a result of this demographically accelerated aging process, the birth rate in some areas has fallen below the death rate.

Two and a half million small-time entrepreneurs in non-agricultural branches in the United States went bankrupt and joined the army of hired labour. The growing importance of research and new technology in various fields of production has given priority to big capital over small and medium capital. The technical improvement of large enterprises has also struck at small-time operators many of whom have been forced out of business or had their enterprises taken over.

An important potential source of hired labour is the non-gainfully-employed population, which has already supplied about one million additional workers. In the period 1950-67 the percentage of the US population not gainfully employed was somewhat reduced (from 40.1% to 39.4%), with important shifts in its structure: the proportion of students went up while that of housewives went down.[1] Thus, most of this

[1] From 1957 to 1964 the percentage of students among the population of the USA not gainfully employed rose from 14.1% to 18.4%, while the percentage of housewives went down from 68.2% to 62.1%.

million were women, who had hitherto been concerned solely with housekeeping. The percentage of working women among all women of 16 years and older grew from 33.9% in 1950 to 43.4% in 1970. Women account for most of the accretion of the working population in that period. The percentage of women among all employees in these years rose from 29.4% to 37.7%.

As a result of an improved economic situation the number of hired workers in the United States rose by another million through jobs becoming available for that number from the pool of unemployed.

These sources of replenishment of the hired labour force, though subject to variation, are also characteristic of the other advanced capitalist countries.

The outdated social relations carried over from feudal times have persisted the longest in agriculture. At present the displacement of pre-capitalist relations of land ownership, and their transformation into capitalist relations has not yet been fully accomplished in the advanced capitalist countries.

The owners of big landed estates are gradually becoming capitalist owners and merging with this class. Various forms of métayage are gradually assuming a capitalist character.

Farmers in the advanced capitalist countries are no longer mere petty owners. There is now an agricultural proletariat, and a big and small agricultural capitalist class. Agriculture is also assuming a commodity character, while the agricultural producer is more and more becoming a commercial operator (and not only in the

United States and Britain, but also in the countries of Western Europe).

The transition of agriculture from its equivalent of the manufactory stage to its present equivalent of large-scale machine production is being accompanied by an intensified social differentiation of the rural population, whereby the small owners are ousted and obliged to become industrial workers.

The outflow of the labour force from agriculture played an especially important role in countries with overpopulated rural areas, such as Japan, Italy, France and West Germany. In Britain, where the proportion of the agricultural population was small even before the Second World War, this source played but an insignificant role. The infiltration of big capital equipped with modern technology and industrial methods of production and the pauperization of small owners and often the expropriation of their holdings make up the social aspect of the outflow of the labour force from agriculture.

As we have already mentioned, most of the people who leave the agriculture are in the younger age group, which results in a deteriorating demographic composition of the rural population. In Japan, between 1960 and 1966, the size of the average farmer's family diminished from 5.72 to 5.22 persons. In the same period, the number of men aged 15-59 engaged in agricultural production diminished by 29.5%, and the total agricultural population was reduced by 20.8%.

In Italy the number of people engaged in agriculture fell from 6.8 million in 1954 to 5

million in 1964, i.e., by 26 per cent, with the number of men alone declining from 5.5 million to 3.3 million. This means that for the first time there was an increase in the number of women farmers, who replaced the men, many of whom had left for the cities. Out of the 1.8 million persons who left agriculture, nearly one million were earners of supplementary incomes in the family, 0.5 million—independent owners, and only 0.3 million—hired workers.

The squeezing out of the small owner-employer, largely the result of government policy, is another source of replenishment of the hired labour force in the industrially advanced countries of Western Europe and in Japan. In the Federal Republic of Germany, between 1950 and 1967, the number of independent owners in industry and construction diminished from 889 thousand to 721 thousand, i.e., by 19%.

The intensive process of capital concentration in France led to a situation in which 84,000 small establishments employing 1-10 persons (26% of the total number) went out of business in the period between 1954 and 1962.

The growing role of women as a work force

The number of women employed in the national economy has increased in all the advanced capitalist countries. In most of them the rate of increase in the employment of women is ahead of that for men. As a result the proportion of women making up the hired labour force rose in the Federal Republic of Germany from 30.8% in 1950 to 33% in 1968, in Britain

from 32.7% to 36.2% over the same period, and in Japan from 25.7% to 31.5%. Exceptions are Italy and France where the total number of women workers rose only slightly, less than the men, so that their proportion in the total work force fell by 1.7%.

On the whole, statistics show that the role of women in the economic life of society has increased considerably. This has been due to deep-going social, economic, technical and demographic factors.

The decrease, as a result of mechanization and automation, in the number of jobs requiring sheer physical strength, the shorter working week, and the expansion of the non-productive sector—all provide opportunities for the more extensive employment of women. In another direction this tendency has also been stimulated by the easing of housework through the widespread use of household appliances, new chemicals and synthetic textiles, etc., and the provision of community service establishments.

Other factors which have played a part in the growing rate of employment of women are the tendency towards smaller families and the earlier birth of the last child and the generally higher level of education among women.

Part-time employment of women also plays an important part in the general tendency towards a higher rate of employment of women. For example, part-time workers in the retail trade and services work only at peak hours or during a sales rush. In the United States, more than 25% of all women engaged in non-agricultural occupations worked only part time in 1966. Women make up 65% of the part-time

personnel working "because they wish to", and 48% of those work "for economic reasons".

But there are also factors which hold back the expansion of employment of women. Among them are such demographic changes as the lowering of the proportion of women in the population of working age and the increase in the number of marriages. The extension of the school education period [1] and discrimination in jobs hold back somewhat this otherwise fast developing process.

The post-war growth of employment of women is characterized by the fact that the majority of women holding down jobs are married. Whereas, in 1947, 46% of working women in the United States were married, by 1968 the proportion had shot up to 63.5%. Moreover, whereas in the 1940s and 1950s most of the women employed were 35 years of age and older, in the 1960s the number of women under 35 (even those with children of pre-school age) had grown considerably.

In Britain the proportion of married women in the total number of women job-holders rose from 40.6% in 1950 to 54.6% in 1965. Over the past twenty years, the number of married women workers has been growing regardless of labour market fluctuations and despite the fact that the number of women of working age is decreasing as the result of the low birth rate in the 1930s and in the 1950s.

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[1] It has been estimated that the extension of school education in the Federal Republic of Germany will reduce the number of women available to the work force by 200,000 in the near future.

Despite the growing importance to the economy of the work performed by women, there is overt and covert discrimination against women job-holders. On the whole the earnings of women lag behind those of men. For example, the average weekly earnings of women workers over 18 years old employed full time in industry in Britain at the end of 1967 was less than half the average earnings of men. Altogether, the average hourly earnings of women come to only 60% of the earnings of men. To a large extent this is the result of an artificial discrimination against women. The wide-scale employment of women at reduced rates, in this way, serves as an additional means of exploitation of the working class.

The difference in the character of the work of men and women furnishes part of the explanation of the difference in their earnings. Despite the fact that mechanization and automation have largely obliterated the difference in the work done by men and women and that, with the growth of the intellectual functions of labour, physical work has lost its former importance in the process of production, women are still not admitted to many better paid occupations and jobs. In the United States, for example, women accounted for 10% of research workers and only 1% of engineers in 1960.

According to a sample survey, the majority of women in the British manufacturing industry do unskilled work. Only one-third of the firms examined employ women on skilled and semi-skilled work. Official statistics present much the same picture.

Women as a rule occupy only the lowest

rungs of the working class hierarchy created by the monopolies, and their jobs are relatively much more insecure. Women are largely responsible for the buoyancy of supply of the labour force on the market.

The growing employment of women serves as a requisite for the development of their class and political consciousness.

Having largely exhausted the reserves of the relative overpopulation in the countryside, the monopolies in a number of countries of Western Europe, since the second half of the 1950s, have been importing foreign workers on an ever larger scale. The traditional outflow of manpower from Europe to America has, since the Second World War, been replaced by a rapidly growing influx of manpower into the countries of Western Europe.

The UN Economic Commission for Europe reported that there were 5,380,000 immigrant workers in France, the Federal Republic of Germany, Britain and Switzerland in 1965, making up 3.5% of the total work force of these countries. The principal suppliers of manpower are the South-European countries with considerable reserves of rural overpopulation—Spain, Italy and Greece.

As a rule, foreign workers do the least skilled and physically the hardest work. A UN report says that "as a result, certain countries of Western Europe are beginning to show a new type of occupation distribution characterized by a certain stratification within the working class; on the one hand, workers who are nationals of the countries in question tend to cluster in employment that is more desirable on grounds of good

pay, stability and high social prestige, and frequently requires high skill rather than physical effort, while, on the other hand, immigrant workers flow into employment that may in some cases carry good pay (as the construction industry), but is generally characterized by less pleasant working conditions or low social prestige." [1]

Foreign workers are the last to be hired and the first to be discharged, being used to adjust the labour force to the cyclical fluctuations typical of the capitalist economy.

The working people of national minorities find themselves in a similar situation. In the United States, for example, Blacks do the hardest and the worst paid jobs, are cruelly exploited and are the first to lose their jobs when the economic situation deteriorates.

The myth about the "new middle class"

The category of hired personnel includes socially diverse elements—from company presidents and ministers to unskilled labourers. But the great majority of hired personnel are the various sections of the working class, whose composition and size changes with the development of capitalism.

The working class rose from the industrial proletariat, which emerged with the advent of a large-scale machine industry.

In the last century, in the early stages of the

[1] *1967 Report on the World Social Situation,* United Nations, N.Y., 1969, p. 199.

industrial development of the capitalist countries, the largest group of industrial workers was concentrated in the textile industry and other light industries. According to a census taken in England and Wales in 1861, 40% of the total of 1,605,000 industrial workers were employed at textile mills (wool, cotton, worsted, linen), 35% in coal and ore mines and about 25% at foundries and metal-working manufactories.

The growth of capitalist industry led to a concentration of workers at large industrial establishments, and to drastic changes in the industrial structure of the proletariat. At present most of the industrial workers in the advanced capitalist countries are engaged in the industries which produce the means of production.

The increased proportion of industrial workers engaged in heavy industry (especially in the machine-building and chemical industries, and the power industry, i.e., in the branches noted for a high level of concentration and monopolization of production) tends to raise the general level of concentration of manpower, and to concentrate industrial workers at the main centres of the anti-monopoly struggle. The transition of the industrial proletariat to the branches which are of decisive importance in the development of the forces of production gives added importance to its economic and political role and increases its impact on the principal centres of the economic system of capitalism.

The industrial proletariat is the main nucleus of the working class, the primary and most powerful source of the working class movement. As a result of industrialization, the size of the

industrial proletariat increased considerably. In the most advanced capitalist countries (Britain, the United States, France, West Germany) it increased from 9 million in the middle of the 19th century to almost 60 million in the middle of the 20th century. In the advanced capitalist countries, the industrial proletariat has become the most massive section of the working class, and its revolutionary nucleus.

Notwithstanding the importance of the industrial proletariat, Marxists have never identified it with the working class as a whole. Lenin wrote that "this 'mission' (of capitalism—*Ed.*) is fulfilled by the development of capitalism and the socialization of labour in general, by the creation of a proletariat in general, in relation to which the factory workers play the role only of front-rankers, the vanguard. There is, of course, no doubt that the revolutionary movement of the proletariat depends on the number of these workers, on their concentration, on the degree of their development, etc.; but all this does not give us the slightest right to *equate the 'unifying significance' of capitalism with the number of factory workers*. To do so would be to narrow down Marx's idea impossibly." [1]

In his study of the conditions of the British working class in the middle of the last century, Friedrich Engels included in it the industrial proletariat, the agricultural proletariat and the proletariat of the mining industry. A hundred years ago the most numerous proletariat in Britain was the rural proletariat (1,098,261), then came the proletariat at factories and plants (1,039,605) and the third place was held by the proletariat of the mining industry (565,835).

[1] Lenin. *Coll. Works*, Vol. 1, p. 316.

Since then the numerical relationship of the various groups of the proletariat has changed and new groups have sprung up. These shifts have been brought about by important changes in the social division of labour, as well as in the socio-economic position of numerous categories of the working people.

In all the advanced capitalist countries the size and proportion of the rural proletariat have been declining, mostly as a result of increasing efficiency in farming. The proportion of tractor drivers, harvester operators, truck drivers and mechanics who by the nature of their work are close to industrial workers, is rising.

Important social consequences follow from the greatly increased proportion of the population engaged in the non-productive sphere. The expansion of this sphere has resulted in an increase in the number of office workers who are now the most numerous group of job-holders. The proportion of office workers, engineers and technicians is also rising in the sphere of material production.

In the United States the percentage of office workers, engineers and technical personnel employed in manufacturing rose from 24.4% in 1959 to 27.5% in 1970. In other capitalist countries they account for about 25% of total industrial manpower.

The scientific and technological revolution has raised the percentage of office workers (including engineers and technical personnel) employed in the national economy. In the United

States, for example, white-collar workers are more numerous than blue-collar workers. From 1940 to 1969 the percentage of blue-collar workers in the United States declined from 47% to 36%, while the percentage of office workers (including engineers and technical personnel) rose from 31% to 47%. It has been estimated that by the end of the 20th century the percentage of office workers will have increased to about 53%, while the percentage of industrial workers will have fallen to less than 30%.

In 1969 the percentage of office employees to the total labour force in Britain stood at 46.4%, in the Federal Republic of Germany at 42.2% and in Japan (in 1968) at 39%.

The rising percentage of office employees, engineering and technical personnel is described by some sociologists as a sort of "new social revolution" and is used as the principal argument in support of the theory of the "deproletarization" of the modern "industrial society" and emergence of a "new middle class" which will allegedly absorb the former classes.

Professor Daniel Bell of Columbia University writes to this effect: "Automation will create a new *salariat* instead of a *proletariat,* as automatic processes reduce the number of industrial workers required in production." [1] A similar idea has been advanced by sociologists Melvin Vincent and Jackson Mayers: "Automation can alter the basic composition of the labour force in the direction of a 'salariat' in place of a proletariat, quite in line with the trend toward middle class status contained in upgrading,

[1] *Dun's Review and Modern Industry*, January, 1962, p. 60.

guaranteed annual wages." [1] A similar line has been taken by Roger Garaudy who in his book *Le grand tournement du socialisme* maintains that the leading role in the political and social development of society is passing to a "new historical bloc" which integrates the technical intelligentsia and the working class. These and other views expounded by Garaudy in his latest works show how far he has turned away from Marxism.

The protagonists of these theories regard only the external aspect of historical phenomena. The changes in the relationship between the "office employees" and "factory workers" in the sense used by the national statistics of these countries means in fact only the changes in the relationship between people who receive their income either in the form of wages or in the form of a salary (or between people engaged in predominantly physical work or in predominantly mental work). These changes do not alone determine the social position of various groups of the population. If classes are defined from the point of view of the scientific criteria set forth earlier in this account (see p. 47) it will be clear that the category "office workers" in the national statistics is a patchwork of social groups and even classes. A considerable proportion of office employees consists of a population group which holds an intermediate position between the main classes. The growth of capital concentration, the infiltration of mono-

[1] Melvin Vincent and Jackson Mayers. *New Foundations for Industrial Sociology,* Toronto-London-New York, 1959, p. 370.

polies into new spheres of the economy, and modern technology intensify the process of the social stratification of office employees. A small proportion of office employees are part of the giant mechanism of capitalist exploitation. They serve as agents of the state in the apparatus of coercion or in the system of monopoly propaganda, and retain and consolidate their privileged position at the expense of the working class.

However, a considerable proportion of office employees, by virtue of their place in the capitalist system of production, their relations to the means of production, and their role in the social organization of labour have, in the course of the 20th century, and especially now, been drifting closer and closer to the industrial workers. In the last century, engineers, technicians and trade and office personnel, though they were hired labour, enjoyed privileges that separated them from the mass of workers and put them closer to the bourgeoisie. And owing to the universal character of their work and the need for prolonged education and training which few people could afford, the salaries of engineering, technical and trade personnel were much higher than the wages of qualified workers doing physical work.

In the old days a small staff of office workers maintained close contact with their employer. An important part of their activities was the discharge of administrative and disciplinary functions with regard to the workers. With time, an office employee could accumulate enough money to start his own business.

The situation has changed radically today.

With their numbers increased, the engineers, technicians and trade personnel have found themselves in an increasingly subordinate position with regard to the power hierarchy of capitalist society. Most of them have nothing to do with the function of control and supervision of workers. They have even ceased to identify themselves with the management. The deepening capitalist division of labour has deprived their labour of its universal, creative character. The same methods of capitalist rationalization which were once applied only to industrial workers are now being used on an ever larger scale with regard to office employees as well, with their work being more and more mechanized and automated. The difference in the size of the wages of skilled workers and the salaries of office employees is getting smaller and smaller and is, not infrequently, in favour of the former. The once secure position of office employees on the labour market has become insecure, and now there are just as many victims of unemployment among office employees as there are among industrial workers.

In 1961 an American economist, J. Barbash, wrote: "Increasingly, the white-collar worker—and this ranges from the sales clerk to the professional engineer—is a statistic, a payroll item. He is increasingly part of a large group of people, all doing the same work. He is several times removed from the sources of authority and power in the management of enterprise. His identification with management is becoming more and more vicarious and the dream that he, too, one day can be a boss is steadily evaporating. Automation accentuates, underscores, and empha-

sizes the process of alienation of the salaried employee from the employer. The introduction of electronic devices as a substitute for highly personal, professional, technical and administrative skills is already having the effect—and will inevitably have the increasing effect—of subjecting the salaried employee to industrial discipline with its uncertainties and pressures. When the white-collar person becomes a baby-sitter for an automated machine, pride of work gets drained out of his job, and he is going to try to join with his fellows." [1]

Modern state-monopoly capitalism is eroding the last privileges which used to distinguish office and trade personnel, technicians and engineers from workers. In the advanced capitalist countries office employees are becoming, by reason of their social and economic standing, less and less distinguishable from industrial workers.

The working class of the advanced capitalist countries bears no resemblance to the proletariat of the last century or even the early 20th century. The working man of today is generally better educated and has a higher level of skill. He is no longer the man in oil-stained blue overalls of the old days doing hard physical work, but a worker who exercises an increasing number of intellectual functions. The social composition of the present-day proletariat is becoming more complex and varied, and includes not only workers who perform predominantly intellectual functions, and workers engaged in

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[1] *The American Federationist,* March, 1961, p. 7.

the sphere of production but also workers in the sphere of trade and services. With the changing socio-economic conditions, technicians, engineers and trade and office employees are becoming, in effect, a special stratum of the working class.

The proletarian group of office employees is less united and organized than the industrial workers, and many are still unaware of the fact that they are part of the working class. But the intensified exploitation of office workers by the monopolies, pegged salaries, job insecurity and the increasing instability of their position in general has served to awaken their class consciousness and arouse them to industrial action. It is significant that in recent years more office workers have been organized into unions and more have been taking part in strikes than ever before.

What is the total size of the working class and what is its proportion to the whole working population of the advanced capitalist countries? According to a conservative estimate the total number of workers in the United States (including the proletarian group of office employees) increased from 40 million in 1950 to 48 million in 1960. Its proportion to the gainfully employed civil population grew over this period from 63% to 68%, and to the hired labour total from 77% to 79%. In France the size of the working class increased from 9.7 million in 1954 to 10.3 million in 1962 (from 51% to 54% of the gainfully employed population). Similar changes are taking place in other advanced capitalist countries.

The absolute and relative growth of the working class gives the lie to the supporters of the "deproletarization" theory. In the developed capitalist countries the working class constitutes the majority of the gainfully employed population.

The changing functions of man in the process of production as mentioned here, and the increasing importance of education and working skills in the modern system of production increases the importance of the working class which plays a vital role in scientific and technological progress. The working class is growing both quantitatively and qualitatively. It is becoming better qualified in terms of knowledge and skill, better educated and further advanced culturally. The intellectualization of the working class creates favourable conditions for the further advancement of the proletarian ideology.

With the progress of the scientific and technological revolution the social base of the working class movement is also expanding. New possibilities are emerging for a still closer identification of industrial workers with the proletarian engineers, technicians and office personnel. At the same time the increasing proportion of the less organized groups of working people forming part of the working class holds back the progress of the working class movement. Great importance attaches to the organizing of office workers and their participation in the working class movement, if their specific demands are to be satisfied.

The working class is now better prepared than at any other time in the past to perform its main role in the liquidation of the exploiting system of social production and in the building of a new, socialist society. In this it can draw on the experience of its long class struggle against the bourgeoisie and on the experience and international prestige of the world socialist system. The consolidation of the world socialist system helps strengthen its class positions. The growth of the working class, its changing composition, and the rising level of its skill and education promote its importance in the life of society.

These shifts in the social structure of modern capitalism and, in particular, a certain levelling tendency in the conditions of work and life of various categories of working people create more favourable possibilities for consolidating and expanding the anti-monopoly movement.

New prospects are opening up for a further consolidation and development of the alliance of the working class with other social forces fighting the monopolies—the petty bourgeoisie of town and countryside and the members of various professions. The growing interference of the state in scientific research is being accompanied by an unprecedented militarization of science. Never in history has there been such a concentration of talent and education as is now being employed on developing and perfecting weapons of mass destruction.

By forcing these anti-humanistic aims upon science and culture state-monopoly capitalism is arousing growing opposition throughout the world. Intellectuals, especially, are reacting against the standardization and sterilization of minds by the dissemination of "mass culture",

or rather, that semi-culture which is even worse than no culture at all. Intellectuals are the first to feel dissatisfied with this state of affairs, when ideas are replaced by gross materialism and cupidity. American universities are not only important centres of research, but also centres of mass anti-war action by the student youth, scenes of struggle, often bloody struggle of the young people against the Establishment.

Intellectuals cannot serve the cause of progress and at the same time remain in "splendid isolation" from the people. It is only in alliance with the working class—the principal revolutionary force of our time—that they can live in society and play a role commensurate with their possibilities and interests. The changes that have affected the working class (higher level of skill and education, the growing importance of intellectual functions in industrial operations) help strengthen and broaden this alliance which is so dreaded by the capitalist class.

4. CHANGES IN WORKING CONDITIONS AND WAY OF LIFE

Progress in science and technology, the growing role played by science, which has made it an important productive force, and the application of science to the production process have all added a highly dynamic quality to modern life, speeding up the rate of growth of production and broadening the range of goods produced. In the more advanced countries the volume of production of consumer goods and services is doubled every 15 years, on the average. In the opinion of the American political writer, Alvin Toffler, most of the products we use today came into being within the life-span of the last generation.

In the United States the items produced by the machine-building industry, the chemical industry and the building materials industry are almost completely replaced every 20 years. Every year about 300,000 new commodity items come on the market, most of which soon become obsolescent. In 1971, in the United States, the proportion of new products unknown four years before was expected to account for 22-33% of total output in the machine-building industry, 20% in the textile industry, and 16% in the chemical industry.

The only permanent factor in present-day scientific and technological progress is fluidity and rapid change. The entire mode of life, the volume and character of consumption which, in the past, remained essentially the same for many decades now undergo considerable changes in just a few years. These changes affect not only most important spheres of human activity but also the relation in which they stand to one another.

Work has always played and will continue to play the leading role in life. The present-day scientific and technological revolution has wrought important changes in the organization of work, in working conditions and in the working environment.

New methods of capitalism to raise labour efficiency

Under highly mechanized and, particularly, under automated production, the methods employed by capitalism to make the most efficient use of labour assume new features. Unlike the previous stage of industrial development characterized by the use of specialized machinery and the conveyor-belt method of production, automation requires integration of individual operations and not their fragmentation. The full automation of production offers the kind of prospect prophesied by Marx a hundred years ago: instead of being the principal agent of production, the worker stands next to the process of production. The conditions of labour and the operations involved in it are changing. The worker finds himself in a new environment—in front of an instrument panel with signal lights, control buttons and switches. Now he spends more and more of his time, not on the products being produced, but on streams of information. The worker is required to be keen, alert, and capable of making decisions himself. The high cost of machinery places still greater responsibility on the worker.

The new capitalist methods of raising labour efficiency which correspond to the present stage of scientific and technological progress are aimed at stimulating not only physical effort and making manual work more rational in line with the recommendations of H. Taylor, but at stimulating nervous and mental output as well and making better use of equipment and materials and improving the quality of products.

Industrial psychology and sociology play no small part in promoting the most rational organization of labour under capitalism. Industrial psychology helps select the right personnel for the right job, and to organize specialized training and advancement courses and develop effective methods of job training. At large factories and plants, psychologists and other labour specialists, together with the management, develop new methods of work and improving working conditions, work out ways of placing factory personnel to the best advantage, think up new time schedules, incentives, etc.

During and after the war a good deal of attention was paid to the industrial application of psychology. The "man-machine" and the "man-automatic mechanism" systems are being studied for the purpose of establishing (from the point of view of man's psycho-physiological possibilities) optimal principles of designing instruments of labour and especially systems of control and regulation of machines and machine units.

In recent years industrial psychology and sociology have been occupied by such problems as incentives and attitude to work, group conduct and psychology ("informal" groups, teams, the factory), and the attitude of workers to the management and to the organizational structure of the factory. A study of these problems and the development of practical measures aimed at creating a psychological and social atmosphere favourable to the aims of capitalist exploitation, is being carried out under the guise of the catch phrase "human relations". The "human rela-

tions" doctrine has become not only an economic, but also a political and ideological weapon of big business.

At present many large companies employ psychologists, sociologists and other specialists whose job it is to maintain "good relations" between workers and management. Significantly, the number of social scientists in American manufacturing industry almost doubled from 5,700 in 1950 to 11,208 in 1960. A poll conducted at 40 American aircraft-building companies in 1957 showed that out of the 32 companies which filled in the questionnaires, 24 had programmes of research into the "human element", and 6 companies were about to launch similar programmes. The "human element" also received major attention in other basic industries.

Research of this kind has been stimulated by the profound changes in the material and technological basis of production under the influence of the scientific and technological revolution, which has greatly increased the importance of the intellectual and emotional aspects of work and further stressed its social character.

Subjected to the will of the capitalist and reduced to being a mere instrument of his profit, the worker is alienated from the production process and hardened in his attitude towards labour as an unavoidable evil, a form of compulsion. American sociologist R. Blauner sees in automation of production a way of putting an end to the alienation of the worker: "The alienation curve begins to decline from its previous height as employees in automated industries gain a new dignity from responsibility and

a sense of individual function." [1]

But the fact, of course, is that large-scale automated capitalist industry cannot eliminate the alienation of the worker, cannot change his subordinate position in relation to the mass of substantivized labour embodied in automated conveyor lines and other machinery, cannot eliminate his antagonism toward the capitalist mode of industrial management with its regimentation and pressure. More than that, it is precisely because the scientific and technological revolution has created conditions for the "technical emancipation" of man, for improving his education and his industrial skill, that the worker feels more dependent on capital and deprived of virtually all his rights.

The alienation of man in production (which is only one form of alienation) is to an ever greater extent the result of the fact that he cannot identify himself with the aims of capitalist enterprise, that he is by virtue of his position opposed to the methods of capitalist rule.

The more powerful the means of production are, the more helpless and oppressed is the working man in capitalist society. His physical and mental activity has been fragmentized and made subordinate to the heartless system of bureaucratic rule which executes the will of the capitalist. At the same time, for the further development of production in the direction of automation important factors are the position

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[1] R. Blauner. *Alienation and Freedom,* Chicago, 1964, p. 182.

of the worker, and his sense of responsibility and social awareness. Western sociologists are trying to resolve this fundamental contradiction—which shows that the productive forces have outgrown capitalist production relations—with the help of their "human relations" theory which conveniently ignores the root of the problem.

Western sociology displayed no interest in the alienation problem when capitalism needed the worker's muscles only. Attention is being focused on this problem now because capitalism finds it necessary to pay attention to the consciousness and psychology of the worker, due to the changing content of the labour process. The first experiments conducted by sociologists at Western Electric in Hawthorne (USA) at the end of the 1920s and in the early 1930s, like the experiments of later years, showed that a heightened sense of responsibility of the workers and their interestedness in the results of their work can markedly raise its efficiency and lower labour turnover.

"Human relations" are regarded by Western sociologists as an antidote to the alienation of the worker; they ignore the main cause of alienation, which is the nature of the ownership of the means of production, and lay the blame on various technical, organizational and psychological factors. Accordingly, their recommendations do not go beyond the purely technical, organizational and psychological methods of influencing the worker.

In practical terms the "human relations" approach plays an important role in modifying the ways capitalist commands are administered by

replacing crude regimentation with subtle, liberal-sounding coercive methods, with carefully planted illusions of workers' "participation" in economic affairs. A good deal of attention is paid to the training of foremen and managers in the methods of "building up" and "managing" personal relations. Psychology and sociological methods are used in the study and regulation of the composition of teams and "informal groups" (workers' unions outside the purely administrative structure). Psychologists conduct opinion polls among workers, interview them and give advice and consultations. Capitalist propaganda of the monopolies is disseminated by way of factory newssheets, bulletins, brochures, publicity posters, etc. Very often various "profit-sharing" schemes are introduced in the form of small bonuses. The ultimate aim of all these measures is to camouflage capitalist exploitation and create a favourable psychological and social climate for the attainment of maximum capitalist profits.

The monopolists set great store by psychological methods for raising output. In 1961 a poll was conducted of 114 American companies. In reply to the question "How can production efficiency be raised," 90% of the companies said that the "human relations" programmes held out great promise.

The "human relations" strategy is used to help prevent strikes, to weaken the influence of trade unions upon the rank-and-file membership, and as a method of winning working class co-operation with the bourgeoisie.

In exposing the use to which the "human relations" doctrine is put, both in theory and

practice, in the exploitation of the working population, it should not be overlooked that there is also a positive side to the application of industrial psychology and sociology, its use in the establishment of a rational organization of work and proper relations among the people engaged in production, and for determining the means and conditions of production appropriate to human requirements and capacities.

As we have seen, automation in production lightens the physical demands made upon the worker. And with the introduction of artificial daylight, air-cleaning facilities and morale-boosting devices (lighting, sound-effects, the use of colour, etc.) the overall conditions of work have improved somewhat. Automation as such creates technical facilities to lighten the burden of labour and lend it an element of creativity. But as a rule, its utilization for monopoly profits, coupled with the capitalist methods of organization of the work force, described above, results in an intensification of labour, which at the same time becomes more complicated. Automation keeps the worker in a state of unremitting emotional tension for long periods of time, giving no opportunity for the expenditure of physical energy. In this respect he can in a way be likened to the pilot of an air liner in the sense that he, too, is required to watch the instruments and be on the alert for any possible emergency. He is not permitted to make mistakes, even minor ones.

The research done in this field shows that the transition to automation puts an additional strain on the worker. This was the conclusion of American sociologist Charles Walker who

spent six and a half years examining the conditions at a newly built fully-automated seamless tube manufacturing plant. One of the workers approached said: "On my old job... my muscles got tired. I went home and rested a bit and my muscles were no longer tired. On this new automatic mill, your muscles don't get tired, but you keep on thinking, even when you go home." [1]

The examination of a newly automated plant for the manufacture of car engines in Detroit by William A. Faunce of Michigan University also showed that the worker is now required to be more alert than before. The introduction of automation calls for more "overseer" personnel; it has given foremen wider powers for pressure and control. Working places are now spaced wider apart, giving workers less chance to associate, and the nature of the work is more nerve-taxing. Some workers develop a sense of social isolation. [2]

The results of the research carried out by F. Mann and L. Hoffman of Michigan University merit attention. They made a comparative study of the working conditions at two power stations, one of which was equipped with modern machinery and automatic controls, and the other with older equipment. To the question "How often does your work make you feel

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[1] *Harvard Business Review*, February, 1958, p. 112.

[2] In reply to the question "Are you able to talk very often to the men around you while you are working?" over 80% of the interviewed answered affirmatively with regard to their old job, while only about 45% answered affirmatively with reference to their present job in the automated plant.

'jumpy' or nervous?" they received the following replies:

Answers	Station with automatic controls %	Station without automatic controls %
Very frequently or fairly often	17	11
Occasionally	57	40
Never or very seldom	26	48
Not ascertained	0	1

Thus three-quarters of the workers at the power station with automatic controls very frequently or occasionally felt nervous tension, while at the power station without automatic controls only half the workers had this experience.

So far the proportion of fully automated industrial establishments is quite small. However, the influence of automation must be judged not only in terms of production technology. Factory owners who are unable to upgrade their obsolescent equipment willingly adopt modern systems of labour organization and rate-setting, which inevitably leads to the intensification of the production process. Dealing with the effects of automation of capitalist production in the non-automatic sector Norbert Wiener, the father of cybernetics, remarked that automatic equipment was the economic equivalent of slave labour, while any form of labour which emulated slave labour must adopt the economic conditions of the latter.

Increased intensity of labour, as distinct from higher labour productivity, is limited by the possibilities of the human organism. In pursuit of superprofits the monopolies intensify the labour process beyond the physiological limits of human endurance, i.e., at the expense of the workers' health, when the trade unions offer little or no resistance.

The ill effects of this intensification achieved through the use of modern technology which imposes severe stresses upon the worker reveal themselves much more slowly than do the effects of hard physical labour. This posed all the more danger to health, for these ill effects are in the area of the very vulnerable and so far insufficiently studied higher nervous system. The situation is aggravated by the fact that the field of labour health and labour protection is entirely controlled and dominated by the monopolies and here, just as in the case of the rate-setting systems employed, the important factor of the nervous strain experienced by the operator of automated machinery is deliberately underestimated.

Sustained stress of the nervous system and the resulting fatigue drain the energy of the worker and cause various nervous and psychic disorders and other diseases which on the face of it have nothing to do with the labour process but which have been brought on indirectly by nervous exhaustion. Clearly, therefore, the concept of "occupational disease" calls for a much broader interpretation. The US congressional committee on automation has found that the greatest incidence of peptic ulcers among American industrial workers is among skilled

mechanics, who expend much less muscular energy than most of the workers. The smallest number of cardio-vascular cases is registered among unskilled workers, and the greatest number among computing machine operators.

An investigation carried out in New York indicated that one out of every four adult Americans suffered from nervous or psychic disorders of one sort or another.

The uncontrolled exploitation of a worker's nervous and mental energy affects him as a human being, his ability to think and to feel. That is why the protection of the physical and mental health of the worker and study of the complex inter-relationship between man and machine in the conditions of automation is a matter of top priority.

Work and recreation

The achievements of the scientific and technological revolution not only make it possible to reduce the length of the working day, they also make it necessary to do so. Well-planned recreation makes for fuller utilization of labour resources and also provides for man's professional and general development.

However, in spite of the fact that there has been a rapid rise in labour productivity in the leading capitalist countries since the war, there has been no significant cut-back in the working week. Moreover, overtime (especially in periods of labour shortage) has become a regular feature for, on the one hand, it enables the owners

of industry to increase their profits without additional investments in fixed assets, and on the other, it is used by the working people as a means of narrowing the gap between their wages and their growing demands for material and cultural benefits. In France, the average working week in industry as of January 1, 1970, was 45.8 hours, the longest working week in all the advanced capitalist countries, with 32.5% of all workers putting in 48 and more hours a week.

The mounting cost of plant and equipment and the shortening of its useful life because of obsolescence encourages the capitalists to extend their appropriation of the results of the labour of hired workers to the whole 24 hours available. A report by the International Labour Office on the effects of technological progress in the metal working industry states: "Until recent years, shift work was infrequent in most metal working plants, two or three shifts being usually resorted to only in exceptional circumstances, such as temporary periods of peak production, to meet contract deadlines, for instance. In many plants, however, maintenance work is often carried out on a night shift. With the increasing use of more highly mechanized equipment and automated installations, there has been a growing tendency, in many metal trade sectors, to resort to shift work." [1]

The metal working industry is no exception in this, for a similar situation obtains at the au-

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[1] *The Acceleration of Technological Progress and Its Influence on the Effective Utilization of Manpower and the Improvement of Workers' Incomes,* ILO, Geneva, 1962, p. 52.

tomated factories of the chemical and other industries.

The more recent switchover of office employees to shift work as the result of the use of computers and other information-processing machinery has given rise to serious problems in labour-management relations.

A review of the effects of automation on office employees states: "The studies published since the 1959 ILO report indicate that extended hours of work are common with automated office equipment, and that this trend will become more marked, partly owing to the spread of automation and partly as management seeks to take fuller economic advantage of the equipment. The extended hours often involve overtime, but in a considerable proportion of cases shifts are being worked." [1]

Shift work causes serious disruption to the workers's sleep, meals and rest. Without special protective measures, medical control and an improved shift rotation system, it may affect the worker's health seriously, for it imposes much greater stresses on the nervous system than the usual system of fixed hours. Although there has been no substantial reduction in the working week in the advanced capitalist countries since the war, the amount of time off work has been increased through longer holidays which the workers have wrested from their employers. [2] In addition, the development of transport and

[1] "Labour and Automation", Bul. No 5, *Automation and Non-Manual Workers,* Geneva, 1967, p. 17.

[2] In France the average length of paid holidays for the adult population increased from 25.3 days in 1961 to 27.6 days in 1964, i.e., by 9%.

public services, and the introduction of labour-saving devices in the household have helped to further increase the amount of free time, and this tendency is growing.

With higher labour productivity a further reduction in the working week is possible, provided the trade unions take action to this end. By the end of this century the working week in advanced countries may well be reduced to about 30-37 hours. All of this means that already now the question of the use of leisure time has become one of great importance.

The changing content of labour, with the accompanying higher educational and cultural level of workers has resulted in a tendency for leisure time to become more "intellectualized" and, at the same time, less passive. Working people are using their free time for supplementing their knowledge (which is becoming increasingly necessary for discharging one's professional responsibilities) and for absorbing new information, the volume of which is growing in geometrical progression.

Increasingly, working people have more time for various social activities, for tourism, sport and hobbies. Active recreation helps in relieving the nervous and psychological strain they are subjected to at work. An important role in all this is played by workers' political parties and trade unions. It should not be forgotten, however, that where there is a poor cultural background and little training, an increase in leisure time may have negative social effects (gambling, drug taking, a rising incidence of crime).

Alongside the tendency towards a more in-

tellectual and productive use of leisure time within the framework of present-day state-monopoly capitalism there is developing an opposing tendency—that of the deliberate inculcation in the minds of working people, through the mass media, of attitudes of social passivity and conformity, and of violence.

French sociologists have noted "a decline in the level of development of the person", and a generally lower level of entertainment under conditions where working people find themselves under constant and prolonged nervous strain. By way of illustration they cite the fact that fewer people than before are interested in the classics of literature. In France, the sale of books of "general culture" fell by 4% between 1955 and 1959, while the sale of detective stories and erotic literature more than doubled in the same period.

Benefits and evils of the consumer society

At the end of the last century Lenin wrote that "the development of capitalism inevitably entails a rising level of requirements for the entire population, including the industrial proletariat." [1]

At the present time, when labour productivity is growing at a high rate, and when the level of skill, education and culture of workers is rising and their pressure on the monopolies is mounting, the law of the "rising level of requirements" formulated by Lenin is operating to much greater effect than ever before. The working class in the advanced capitalist countries now earns more money in terms of real wages. As a result, over the past 20 years, average per capita consumption has gone up considerably. Moreover, there have been marked changes in the pattern of consumption itself.

Working people now spend more money on food and clothing, although the proportion of the income apportioned for these items has gone down in all advanced capitalist countries, indicating a general improvement in living standards. Meals now have a higher nutrient value due to a proportionately greater consumption of meat, milk, eggs and fruit. Eating out is becoming more popular, largely due to the growing rate of employment of women.

One of the main items of expense in the family budget is rent, which continues to grow, plus the cost of furniture and household equipment, which, in the conditions of the scientific and technological revolution, is rising all the time. Over the past several decades, refrigerators, washing machines, electric heaters and television sets have become mass consumer goods, and not just luxury items.

Characteristically, in most of the advanced capitalist countries, such items in the working family's budget as transportation, recreation and entertainment are much more costly than ever before.

The growing cost of public transport in part reflects the growth in the use of the private car, motor bike, etc., to meet the daily needs of modern life. The dispersion of the urban population and the growing concentration of production are also putting the home and the place of

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[1] Lenin. *Coll. Works,* Vol. 1, p. 106.

work further and further apart. The purchase of private means of conveyance is also prompted by the high cost of public transport and its inadequate standards of service.

The private car is a major item in the pattern of consumption and an important factor in the whole way of life. In 1969 about 80% of families in the United States owned a car, and 29% of this number owned two or more cars.

In West Germany, Italy and Japan, the growth in the use of the private motor car has created problems and difficulties which often outweigh the apparent advantages.

The growing expenditure by working people on their recreation and entertainment reflects the changed pattern of the use of their free time, a change brought about by the growing complexity of the labour process with its accompanying nervous tension, and as the result of growing urbanization. In addition, the gains won by the working class in the field of social legislation also have a direct bearing on the pattern of the worker's free time.

In the past several years the number of people spending their vacation away from home has grown markedly. In 1970, for example, half the population of France spent their vacation away from their home town. Foreign tourism is also fast gaining ground. From 1950 to 1969 the number of foreign tourists in all countries grew from 25.3 million to 140 million.

Tourism is becoming an important element in the modern way of life, while in some countries it is an important source of revenue which is encouraging the development of a new tourist catering industry.

The pattern of consumption in the advanced capitalist countries reflects various contradictory tendencies. For one thing, it is influenced by cultural requirements which have grown very rapidly in comparison with daily material needs. And it is also influenced by fashion cults and by commercial promotion of goods as "status symbols". Thirst for acquisition, the ideologists of capitalism consider, will result in industrial and office workers giving more of their physical and nervous energy for the benefit of private capital, and it helps to implant middle-class tastes and views and divert workers from participating in socio-political activities.

These changes in the pattern of consumption have affected all the main social categories of the population in the advanced capitalist countries. However, we cannot agree with the Western sociologists who speak about one uniform "consumer society".

The character of consumption, as well as its volume, changes from one social group to another. According to the French National Statistics Institute, in 1965 the average worker spent 43.4% of his income on food, while among factory owners, merchants and the professional class, the figure was 31.2%. The same survey shows that workers spent only 9.2% of their expendable income on transportation, while with the industrialists and businessmen this item of expense accounted for 17.7% of their expendable income.

In the first category 43% of the families examined were car owners, while in the second category the figure was 85%.

In the Federal Republic of Germany, in 1965,

out of a sample 1,000 employees the number of car owners was 267 among workers, 291 among office employees and 406 among officials.

In Britain, a family expenditure survey carried out in 1964 showed that families with a weekly income of less than £5 spent 33.7% of their budget on food, while for those with an income of more than £40 the figure was 21.6%. In the first group 3.2% of the budget went on durable goods, while for the second group this figure was 8.3%. Other expenditures were calculated as follows: transport—2.5% for the first group and 13.3% for the second, services—9.5% for the first group and 17.5% for the second. The difference between the social groups is still more glaring in the quality of goods consumed and in the utilization of services. Thus workers, and especially unskilled workers and others in the low-income bracket share little, if at all, in the benefits of the "consumer society".

The improvement in living standards won by working people from their employers in a number of advanced capitalist countries in the course of years of struggle is seized upon by Western sociologists to glorify the "consumer society". But they gloss over the fact that, at the present level of social development, many of the requirements of a worker's family are unsatisfied or satisfied only in part. For example, there is a considerbale lag in the actual earnings of workers compared with the officially or unofficially estimated budgets of working-class families. Even in the United States, the most prosperous capitalist country, this gap is quite a wide one. The amount needed by a working-

class family to maintain a "modest but adequate standard" of living in 1965 was estimated by the Labour Department to be 123 dollars a week, whereas the actual weekly earnings of an industrial worker stood at about 105 dollars, i.e., 18 dollars short of the required amount.

In 1970, 67% of unskilled workers had an inadequate income to meet the standard set by the Labour Department. In the servicing industries 61% of workers received a substandard income, while for semi-skilled workers the figure stood at 54%, for administrative personnel—27% and for the professional group—21%.

The gap is especially wide in the capitalist countries between the possibilities and the requirements for the satisfaction of such collective social needs as public education, public health services, the provision of necessary facilities for recreation, sports, etc.

Excessive urbanization

An important element in the changes taking place in the productive forces is growing urbanization, which is taking new forms. The postwar rapid industrialization of agriculture caused large numbers of people to move to the cities. Whereas in 1918 half the American population lived in the cities, the proportion now is 70%.

The present rate of growth of the urban population, in the conditions of the scientific and technological revolution, is at least twice as high as the rate of growth of the world population.

It should be noted here that urbanization is not a process merely of the concentration of population and industry in large cities, but is an essential part of the general development of modern society. Urbanization breeds a certain social environment and way of life, and is attended by the emergence of a specifically urban culture and social psychology, by a more concentrated and intensified association of people and by the integration of various forms of human activity.

Being a product of the specific social and historical features of a given society, urbanization reflects in condensed form all of these features and their contradictions. More specifically, the precise features of urbanization at every stage of social development are determined by the nature of the dominant social relations and by the level of the productive forces.

The process of urbanization has been greatly influenced in recent years by the scientific and technological revolution. Whereas in earlier times the different forms taken by urbanization were largely determined by purely industrial factors, now other factors (such as the "production of knowledge" and the formation of centres of social information) have come into prominence. The modern city is not so much an industrial complex, as a centre which controls the economy and scientific and cultural development. The development of transport and communications has led to the concentration in large cities of administrative organizations and also of organizations specializing in the production of information. The city is thus becoming a socio-information complex.

Modern super-urbanization has given rise to a new type of human settlement—gigantic "continuous" cities or megalopolises which unite several city agglomerations. Such giants, a number of which exist in the United States, Japan and some other countries, stretch over hundreds of miles, absorbing tens of millions of people.

According to some prognostications, a large proportion of the world's population will live in megalopolises. In the United States, for example, at least three megalopolises are expected to emerge by the year 2000: Boston-Washington (about 90 million people), Chicago-Pittsburg (about 40 million people), San Diego-Santa Barbara (20 million people). In these megalopolises will be concentrated industry, banks and other financial institutions, offices of giant corporations, publishing houses, cultural and research centres, headquarters of political parties and government. The megalopolis is the sole generator of information, the main element of the social organization of capitalist society, as well as being the centre of political power and economic domination in the country.

The question often arises: is urbanization good or bad? First of all, however, it is necessary to point out that urbanization is a process which cannot be stopped, no matter how we might view it. Apart from that, we might say that it appears to be, basically, a progressive process, in so far as in the course of urbanization millions of people are released from the confines of the rural environment with its relative isolation, restricted contacts and comparative cultural backwardness.

Urbanization provides the possibility for creating an elaborate system of labour combination and cooperation in order to raise its efficiency. It not only provides better everyday conditions but also makes contact between people much easier, giving them more chance to exercise their individual talents, and increases the cultural and creative potential of society as a whole.

On the other hand, urbanization also has harmful effects and causes serious problems which cannot be ignored. Some of them stem from the adaptation of homes, city planning and the people themselves to the growing pressures resulting from overcrowding, and from the stresses of industrial work, city transport, noise and the assault of the information media. However, the most acute social problems of ubranization arise from the dominant socio-economic relations in society. The vices of capitalist urbanization are the product of its spontaneous character, for the vested interests of the capitalists render them incapable of effectively regulating economic and social processes. In these conditions urban development is determined by the vicissitudes of struggle between capitalist interests, by private ownership of land and by the social distinctions of various population groups.

Urbanization concentrates and heightens the most acute contradictions of the capitalist economy, making urbanization a regressive instead of progressive process. The United States, with its mass post-war migration from the rural areas to the cities, affords a good illustration. The highest rate of migration has been among the Negro population in the South as a result of the

break-down in the share-cropping system and racial discrimination at its crudest and ugliest. In the 1950s and 1960s, 1.4 million Negroes moved north. This mass migration from rural to urban areas has now made Negroes more urban than the whites. In some American cities the proportion of Negroes is very high (in Saint-Louis—36%, in Detroit—34%, in Philadelphia—51%, and in Washington—66%). By 1975 it is predicted that Negroes will be in the majority in at least ten large American cities.

As a rule the uneducated migrants from the rural areas have no proper training and are ill-adapted to the conditions of the labour market. They also have to contend with racial discrimination. As a result, apart from the few unskilled jobs still open to them, the Negro migrant workers find they cannot get employment. The migrants make their home in city slums, where there is overcrowding, insanitary conditions and stark poverty.

Coupled with the high price of land and prohibitive rents, the influx of people from rural areas to the cities greatly aggravates the housing problem.

In Britian, where a "slum clearing programme" is under way, the proportion of ramshackle houses is still very high. More than 25% of homes were built before 1881, 18% have no plumbing, and 20% are without bathrooms.

In France the total amount of housing is diminishing by 100,000 apartments every year, because many of the homes have fallen into disrepair. Statistics for 1962 show that about one-third of total housing was built before 1871,

19% before 1915 and only 15% after 1949. As of 1967, 11% of all French homes had no running water, 47% had no sewers, 57% had no bath or shower, 56% had no gas, and 71% had no central heating. In the Federal Republic of Germany, 15 million people live in homes built in the 19th century or earlier.

Another typical feature of growing capitalist urbanization is the emergence of suburbia. The migration of people to the suburbs reflects a process of continuing class differentiation. The well-to-do move to the suburbs to escape the polluted air, noise and pressure of advertizing of the city centre. Closed suburban communities form, which also have a status distinction. In addition, lower income groups buy suburban homes on the installment plan, thus creating the illusion that they, too, belong to the upper crust of modern society.

As a result, the hierarchical social structure has assumed a kind of spatial form, with some classes living in well-to-do and wealthy suburbs while others occupy cheaper residential areas in the centre. Thus, the greater degree of association of people afforded by urbanization has in this case developed the opposite tendency.

The mounting flow of information cannot remove the important problem of alienation of man in a huge city where the density of population is much too high for normal human association, where instead of friendly ties there are only impersonal contacts, making one feel alone and abandoned. The capitalist giant-city is well known for its growing incidence of suicide, robbery and rape, its street accidents, and racial and social conflicts.

The problem of big cities has become one of the most accute and most important problems of our time, and it is likely to be even more serious in the future. According to the UN World Health Organization, city planning is at the top of the list of priority problems of the second half of the 20th century, after the problem of securing world peace.

Solving the social problems connected with urbanization puts to the test the ability of a given social order to regulate its development in the conditions of the present-day scientific and technological revolution.

The efforts being made in the United States to reconstruct its cities and build more housing afford an illustration of how the problems of urbanization are being tackled under capitalism. In 1949 the American government announced that the nation would wipe out the slums in its cities in 10 years. But after more than 20 years this problem has not come any nearer to being solved. The American press comments on the failure to at least moderate the growing crisis of the cities, and on the chaotic nature of the efforts made to clear the slums. Over the past 30 years, only 650,000 low-priced residential apartments have been built, although the shortage of such apartments has been estimated at more than 10 million.

In 1968 a new long-term programme was adopted in the United States providing for the construction, in the first 10 years, of 6 million government-financed housing units designed for families with low and modest incomes. Expenditure for the first 3 years was put at 5.3 thou-

sand million dollars, and for the ensuing 40 years at 50 thousand million dollars.

The programme was widely criticized as being mean, ineffectual, and unrealistic. According to the estimate of Gunnar Myrdal, former executive secretary of the UN Economic Commission for Europe, a sum of 1,000,000,000,000 dollars would be required to solve the crisis of American cities.

Procuring money for financing the urban development programme is another major problem. There will be few who will disagree with the American economists and politicians who regard the reduction of military spending as necessary conditions for improving the situation in the American cities.

The new urban renewal programme hopes to attract private capital by reduced taxation and other privileges. Reliance is placed on private capital to finance the restoration of 20 million homes over a period of 10 years. However, private capital has shown little inclination to join in the fight against the crisis of the cities. The magazine *Fortune* considers that private capital is deterred by the "economic inexpediency" of this sort of activity. According to the journal, the profit orientation of private companies is on the whole incompatible with socially useful undertakings so that whatever might be done in this direction would be "undermining the system that created the American standard of living." [1]

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[1] *Fortune*, August, 1968, p. 89.

Despite these steps being taken by the US government, the ways and methods of fighting the general crisis of the cities fall far short of what is demanded by the immensity of the existing problems.

Environmental pollution

The present-day scientific and technological revolution has added a new dimension to the important problem of the inter-relationship between man and nature. Man can now regulate the forces of nature so that he can tap new natural resources. At the same time this interference carries with it the possibility of disrupting the natural balance of the biosphere, with disastrous and often unpredictable consequences. This world-wide problem is especially acute under capitalism. The mindless exploitation of natural resources for the sake of profit, undertaken with the help of modern technology, leads to soil erosion, to water and air pollution, and to the destruction of animals and plants on a scale that threatens the existence of life itself.

The major responsibility for this destruction belongs to the military and industrial complex. In addition, natural resources are squandered to satisfy not only real but also artificially created requirements inflated out of all proportion through publicity and the mass media.

Pollution of the air with carbon dioxide, sulphur and nitrogen has become one of the biggest problems in large cities. In addition to the traditional forms of air pollution from coal dust and smoke there are now new forms—from au-

tomobile exhausts, and invisible gases from the smokestacks of modern factories. Poisonous smog takes thousands of human lives every year, and kills plants, birds and animals. Other contaminants are carbon monoxide, nitrous oxide, and hydrocarbons. The amount of contaminants in the air has been estimated in the United States at 500 kg a year per person, including children.

In the conditions of the scientific and technological revolution fuel is produced and consumed at a very high rate. For the 20-year period 1946-65 the amount of the world's mineral wealth extracted and utilized was much greater than for the entire history of mankind before this time. It is estimated that by the year 2000 the rate of consumption of fuels will have increased over 1965 levels by 2-2.5 times in the case of coal, by 3.5-4 times for oil, and by 7-8 times for gas. World consumption of power will increase by 4-5 times.

The pollution of water resources has assumed extremely serious proportions. Industrial chemical waste kills the bacteria which purify water in a natural, biological way. It poisons birds, fish and amphibians and finds its way, finally, into the human organism. A high concentration of organic waste in rivers and lakes removes the oxygen from the water rendering it dead, incapable of sustaining any form of life. In the United States, as in the countries of Western Europe, there is not a single large river with uncontaminated water. Industrial waste from factories and plants has contaminated Lake Erie, which serves as a reservoir of drinking water for a densely populated area. Its beaches have

been abandoned and its boating stations closed.

Already drinking water is an acute problem for many cities and rural areas. To meet the needs of industry and agriculture water is pumped from subterranean reservoirs, but this has the effect of draining the surrounding fields of their necessary moisture.

The soil, besides being subject to dehydration and erosion, or to waterlogging, also suffers directly from the activities of industry. Major construction works in the countryside, and open-cast mining are especially destructive. To this mechanical and biological destruction must then be added the chemical poisoning of the soil by pesticides, etc., which kill all forms of life indiscriminately. If these destructive tendencies continue unchecked for another ten or twenty years there will be precipitated such a crisis in the inter-relationship between man and his environment and such devastation as to dwarf the effects of the plague and cholera epidemics of the Middle Ages.

The use of the latest technical means in the uncontrolled and short-sighted exploitation of natural resources calls for a new approach to the problems of economic development and social progress in general. In this respect purely quantitative indicators showing the volume of production, personal income, etc., are quite insufficient. Our concept of social progress must also include the preservation of the environment and the creation of wholesome conditions of existence. The experience of some newly-established industries and of individual industrial enterprises shows that in purely technical terms

the problem of environmental protection is not insoluble. The main difficulties under the conditions of capitalism lie in the social and political spheres. Measures (including long-term and comprehensive planning and scientific prognostication) aimed at rational exploitation of natural resources must inevitably be directed against the rapacious methods employed by the monopolies.

The solution of this problem is closely linked with other vital problems of our time—ending the arms drive, disarmament, and international cooperation.

Thus, the changes in the conditions of work and life which take place under the influence of the scientific and technological revolution also have harmful effects and breed a multitude of acute social and political problems which can be solved only by a progressive organization of society based on social ownership of the means of production.

5. DOES AUTOMATION MEAN FEWER JOBS?

There are different views on the effects of scientific and technological progress on employment. Norbert Wiener, the founder of cybernetics, wrote: "It is perfectly clear that this will produce an unemployment situation, in comparison with which the present recession and even the depression of the thirties will seem a pleasant joke." [1]

[1] Norbert Wiener. *The Human Use of Human Beings. Cybernetics and Society,* London, 1954, p. 162.

Some sociologists believe that automation will, in the future, completely, or almost completely, free man of work and give rise to an "idle society".

Others, in contrast, believe that automation, while doing away with some jobs, will create many more. For example, John Diebold, an American authority on automation, told a congressional committee that automation would result in greater employment stability. [1] American economists Jaffe and Froomkin believe that technological progress will have only a temporary, "self-adjusting" effect on employment. Over the long term, they consider, there is no reason to expect these changes to result in unemployment.

None of these views fully corresponds with reality. In the first place, even with maximum automation, production cannot be run without people. And, as we have pointed out, new technology does not do away with work but only modifies it. What actually happens is a transference to qualitatively more complicated and higher forms of human activity.

Of course, it takes fewer people to serve automatic equipment. Hardly any former types of technology can compare with automation for the number of people released from the production process. For example, the automatic production line for the machining of cylinder blocks releases from 70 to 95% of workers, the automatic cable layer—up to 95% and electronic bank tellers—82% of employees.

[1] *Automation and Technological Change,* Washington, 1955, p. 11.

On the other hand, automation creates new jobs, too, especially in the electronic, atomic and space industries, in rocketry and in the production of laser equipment. Another important area requiring a highly skilled work force is the production and dissemination of scientific and technical knowledge. Conditions are also being created for expanding the branches of the economy directly connected with services, including those serving cultural needs.

Employment instability

Does this mean that the capitalist economy is a "self-adjusting" system, that the workers released by technological progress will be provided with new and not inferior jobs? Let us consider the example of the United States, the first capitalist country to have introduced automation on a more or less wide scale.

In the first place, it is clear that technological progress is not the only and not even the principal factor in determining the size of the work force and the numbers of unemployed. It is linked with a number of other factors, such as the total effective demand for goods and services, and the increase in the size of the available work force and the level and nature of its training and educational background, etc. It is true, however, that when the rate of technological progress, with the accompanying structural changes in the economy, increases, its effect on employment grows, too. Under certain specific conditions, as some researchers have pointed out, a degree of dependence can

emerge between a rising rate of labour productivity, on the one hand, and slowing down of employment growth or reduction of employment, on the other.

The 1957-58 recession in the United States was followed by a period of rapid retooling at factories and plants. From 1958 to 1964 the average annual growth in rate of output was 3.7%. In that period technological progress resulted in a reduction in the number of jobs at the rate of an average 2 million a year. However, no system of job-regulation was organized. It was at that time that unemployment grew into the country's main social problem. According to official figures, the level of unemployment persisted at more than 5% (between 5.2% and 6.8% at various times) of the work force. The official statistics, however, minimize unemployment figures and list only so-called job hunters, leaving out of account many older people, and also women who have given up all hope of finding a job. According to a Labour Department survey, in 1966, when the official unemployment figure stood at about 3 million, there were another 5.3 million people who had applied for jobs but who for some reason or other had failed to renew their application.

With technological progress unemployment, besides assuming much greater dimensions, also becomes more permanent. From 25% to 33% of the unemployed had been out of work for 15 or more weeks.

It should be kept in mind that the introduction of new technology is not immediately followed by a reduction in the numbers of employed, for the management often puts off the di-

smissal of workers released as a result of technological progress until there is a change for the worse in the economic situation. [1]

Mass dismissals and unemployment assume truly menacing proportions when the technical re-equipment of production involves the closure of old enterprises and the building of new industrial establishments in other parts of the country.

In the 1950s the "big four" meat-packing companies in the United States reorganized their production process and the transportation and sale of finished products, on the lines of automation, and bringing production closer to the sources of raw materials and cheap labour. Many of the old plants were closed and the workers dismissed. In 1959 the "Armour" company announced the closure of six plants and dismissal of 5,000 workers. Altogether, about 30 thousand workers have been laid off by the "big four" in the post-war years.

According to a survey conducted among the former workers of "Armour and Co.", in three cities a year later, 56% of them in East St. Louis, Illinois, 30% in Fargo, North Dakota, and 25% in Columbus, Ohio, were still without work.

These mass dismissals hit many workers' families not only because of long periods of unemployment but also because, of the workers

[1] The American economist, Professor Walter Buckingham, wrote: "Some large employers have admitted that they timed layoffs to coincide with periods of recession when general business conditions could be blamed even though increased efficiency from automation was the underlying cause of employee reductions." *New Views on Automation,* p. 51.

who eventually found work, most earned much less than before.

In some cases automation is accompanied by a gradual reduction in the work force through not taking on new workers as jobs fall vacant because of retirements or some other reason.

As a result, unemployment strikes more and more at young people who are just about to make a start on their working life. According to Leon Greenberg of the Labour Statistics Bureau, the problem is not so much for those who lose their jobs as for those who are looking for work. "In many cases the problem will be not who is fired, but who is not hired. Even though companies may successfully avoid layoffs, there will be in many companies and perhaps in many industries, a dropping off in the opportunity for new employment." [1]

It is not surprising that the spread of automation in production has created an atmosphere of nervousness, something that was stressed in the evidence heard by the congressional committee set up to study the impact of automation on employment. Patrick E. Gorman, Secretary-Treasurer of the Amalgamated Meat Cutters and Butcher Workmen of North America, said: "Even the most skilled, even those with the firmest job protection carry with them always a small canker of fear and a taint of uncertainty. No one knows what technological change may bring to them and to their families this year, or next year, or the year after that." [2] A similar

[1] *Impact of Automation on Employment,* Washington, 1961, p. 90.
[2] *Ibid.,* p. 338.

statement before the committee was made by Professor Glenn Rainey of the Georgia Institute of Technology: "I believe that for a person to be working even at a high wage in a factory where he may lose his job tomorrow, is a poisonous thing, and I believe it ruins his life. I believe it will ruin the lives of his children. I believe it will break his home down. I think unemployment threatening over a man is one of the most terrible diseases he can be faced with." [1]

A Gallup poll has revealed that for Americans, fear of automation comes next after the fear of a thermo-nuclear war.

Economic recovery, and the military spending involved in the United States' war of aggression against the peoples of Indo-China led to a temporary reduction in the numbers of unemployed. But the economic crisis of 1969-70 which occurred in the conditions of war and mounting inflation resulted in growing unemployment. At the beginning of 1972 the number of unemployed in the United States amounted to 6% of the labour force, the highest figure for the past ten years.

In the countries of Western Europe, thanks to their fairly high rate of economic development attended by considerable changes in the pattern of their economies, and thanks to a low birth rate, manpower resources were used to a high degree during the 1960s. Here, too, however, together with general technological progress pockets of unemployment emerged in areas hit by economic recession, while any slowdown

[1] *Impact of Automation on Employment*, p. 310.

in the rate of economic growth inevitably led to a dramatic increase in unemployment, as was the case in West Germany in 1967.

In the industrial countries of Western Europe the deteriorating economic situation led to a record unemployment figure of nine million. In West Germany there were 250,000 unemployed (1% of the labour force) at the beginning of the autumn of 1971. Austria had about 63,000 unemployed, Belgium—73,000 (2% of the labour force) and Spain—240,000 (more than 2% of the labour force). In Britain the number of unemployed at the beginning of 1972 was 1,023,000, or 4% of the labour force. The figure for Denmark (November, 1971) was 51,600, for Holland—73,000 and for Sweden—116,000.

But is it correct to blame new technology for the worsening of the general problem of unemployment?

Even when the growth of unemployment is directly connected with the adoption of new technology (with the actual level of employment depending on a multitude of factors), the blame for it should be put not on technology but on the system of social relations under which this technology is used. Many Western economists are silent about this aspect of the problem.

It is precisely the contradictions of the capitalist system of economic development that lead, at a certain stage, to the tendency (which is considerably intensified under the influence of automation) for the number of workers squeezed out of their jobs to exceed the number of new workers drawn into the production process.

The scientific and technological revolution objectively demands a considerable widening of marketing possibilities in order to match the higher rate of growth of production, much wider and better general education and specialized training of the work force, raising its mobility, and a reduction in working hours. Under the capitalist system, however, with its private ownership of the means of production and its antagonistic principles of distribution, these demands are very hard to meet. The conflict between the developing scientific and technological revolution and the social conditions of capitalist production leads to a situation where, at certain periods, the rate of economic growth is not sufficiently high to absorb workers released by technological progress. [1]

This, however, is not the only point. As the scientific and technological revolution develops, there is a growing contradiction between the new structure of demand for manpower and the old structure of labour supply, which took shape under the former system of division of labour.

The adaptation of the labour force to the new working conditions is often hindered by its low educational level and narrow, limited training, which points up the inadequacy of the entire system of education and training for meeting the requirements of the scientific and

[1] The American economist, L. Keyserling, has estimated that it would have been necessary to increase the US annual gross national product by 4.1% over the period 1953-62 for full utilization of the labour resources, whereas the actual figure was 2.7%. Correspondingly, the average annual increment in personal consumption should have been 5.1% whereas the actual growth was 3.4%.

technological revolution. As a result, a proportion of the labour force loses its usefulness and becomes surplus to requirements. The number of people who have been out of work for a long time, and those who have left the labour market altogether, has gone up sharply. At times, a curious situation arises where unemployment and a shortage of labour exist side by side in advanced capitalist countries. The explanation is that the level of employment varies from one occupational and age group to another, and between the sexes.

Unemployment strikes especially at unskilled and semi-skilled workers and the youth. In the United States the rate of unemployment among unskilled workers is twice that for the general working population and for the youth it is 3.5 times as much. Unemployment has reached disastrous proportions among the Negro youth. For example, early in 1971, 45% of the Negro youth living in the slum areas could find no jobs. In France, at the same time, 200,000 workers out of the country's 500,000 unemployed were under 25 years of age.

Workers who are qualified to do only physical labour are the worst off. However, in the past several years, the wide introduction of automation techniques to office work, the spread of self-service in retail trade, and the centralization of management have led to an increase in the proportion of engineers, technicians and office workers in the ranks of the unemployed—from 18.9% in 1958 to 26.8% in 1970. For the first time, these categories of employees, which also included scientists, were thrown out of work, in the United States, by a recession (the

crisis of 1969-70), largely as a result of cuts in federal spending on research, including the space programme. Many office employees, teachers, technicians, engineers and scientists found themselves on the dole, together with miners, railwaymen and other workers. In December, 1970, the rate of unemployment among engineers, technicians and office workers rose to 3.7%, the highest since 1958, when the unemployed were first statistically classified according to occupation. The rate of unemployment among office and sales personnel in 1970 was even higher than among skilled workers.

At the beginning of 1971, the number of unemployed among engineering and technical personnel reached 100,000, a large number of whom were laid off at the NASA centres in southern California and Washington. One out of every five employees in the electronics industry in Massachussets lost his job. At the end of 1970, three thousand out of a total 20,000 physicists (15%) were looking for employment.

The future for employment

So far the dominant type of automation has been partial automation, as mostly adopted by the fast-growing companies and industries. In the future the adoption of machine-tools with programme control and the unitizing of their operations, the wide use of electronic computers, and transition to comprehensive automation in whole industries may seriously worsen the employment situation and may lead to mass layoffs not only of unskilled and semi-skilled workers but also of large numbers of qualified personnel besides the office employees engaged in routine monotonous operations.

Higher labour productivity as a direct consequence of the scientific and technological revolution will increase the proportion of workers released from the production process. It has been forecast in the United States that the number of workers released through higher labour productivity (which, it is estimated, will rise by about 3.5% a year) will reach at least five million by the end of this century.

Provision of jobs for those becoming unemployed as a result of technological progress will pose a serious problem, even with substantial cuts in work time.

It has further been estimated that, assuming an annual growth in labour productivity of 3% and a work force of 140 million by the year 2000, and also a working week reduced to 30 hours, in order to maintain the 1965 level of employment (i.e., 4.5% unemployment) there would have to be a 4.8% annual growth of the total national product. Assuming an average annual rise in labour productivity of 3.5%, the annual growth rate for the national product would have to be 5.3%. However, there would be great difficulty in achieving such a rate of growth because even in the first half of the 1960s, when the development of American industry reached an all-time high for the post-war period, the average annual rise in the gross national product stood at only 4.5%.

The lack of correspondence between the supply of and demand for manpower, and the difficulties of adapting workers to new technology

and to the new division of labour will aggravate the problem of unemployment still more.

Unemployment among the youth is not likely to be eased either. Besides the now prevalent "disguised" layoffs through the reduction or discontinuation of the hiring of new workers, the youth employment problem will be further aggravated by the growing proportion of young people without adequate training, who will inevitably find themselves outside the new cybernetic and computer world of the near future.

An important factor in the growing instability of employment and, in many cases, in the growth of unemployment, is the increasing demand for the professional, industrial and territorial mobility of the work force. The authors of a French survey, "Reflection pour 1985", write: "Two closely related phenomena are taking shape: growing depreciation in many sectors of the economy and the growing mobility of capital and labour... People must be prepared throughout their entire lives to make changes in their trade and residence." [1]

Not so long ago the knowledge of a trade gained by a young worker was sufficient to be the source of his income for his lifetime. This is no longer the case today and will be even less so in the future. Fast-moving technology and the social division of labour will compel the worker to change his trade and even to switch to other industries more than once during his working life. It has been estimated that in the near future workers will have to change their trade once every ten years.

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[1] *Reflection pour 1985*, P., 1964, pp. 48-49.

The adaptation of workers to new conditions will undoubtedly entail many difficulties which state monopoly capitalism will try to resolve at the expense of the working class. The difficulties of adaptation will be aggravated by the narrowness of professional training and the insufficient education of workers. In some cases the mobility of working people may be limited by their attachment to small property.

As in previous years, the problem of employment and unemployment will be especially acute in the United States because in the near future the release of workers by scientific and technological progress will coincide with the inflow of young people to the labour market.

It is also to be expected that the scientific and technological revolution will make the situation of the working class in Western Europe still more unstable and will increase unemployment there, too. The situation will be all the more serious since West European countries will most likely try to cover the same technical ground as the United States but in a much shorter time. In addition to this, scientific and technological progress and the structural changes in society with the attending social evils of capitalism will be further stimulated by integration processes. There are grounds for supposing that the problem of regional unemployment will be further aggravated.

The limited social mobility under capitalism may in the future cause still greater discontent among working people, not only over the growing unemployment but also over the fact that they cannot make full use of their individual talents or satisfy their inclinations. The rise in

the general educational and cultural level of working people, and the new demands that the technology of tomorrow will make on man, add to the importance of the problem of better utilizing and developing the potential talents and abilities of working people.

In the future, much wider use than today will be made of the machinery of state-monopoly capitalism for regulating employment, increasing the mobility of the work force, and for training and retraining workers. At the same time it is quite possible that the economic development of the main capitalist countries will be attended by growing inflation. The past several years have shown that in these conditions a full-employment policy, which clashes with the anti-inflationary measures of the government, may easily be sacrificed for the latter. Thus, unemployment may be created artificially by the very mechanism of state-monopoly capitalism.

The instability resulting from the layoffs and unemployment which accompany the further advance of the scientific and technological revolution may give rise in the future to social conflicts of even greater intensity than those of the recent years, which will urge more decisive action of the working class in defence of its rights.

The level of employment and unemployment will to a great extent depend on the intensity of the working class struggle for guaranteed employment, for a shorter working day and higher living standards, for wider economic and political rights and for real participation in management.

6. CONTRADICTIONS OF THE SCIENTIFIC AND TECHNOLOGICAL REVOLUTION UNDER STATE-MONOPOLY CAPITALISM

Most Western economists no longer deny that changes in the mode of production have a decisive effect on socio-political processes. According to John Diebold, an American authority on automation, "today's machines are far more powerful agents for social change than those of the first Industrial Revolution." [1] Diebold calls for social innovation and remarks that it was the ignoring of social problems in the past that brought forth the ideas of Karl Marx, which "had more to do with shaping the lives of all of us than we might care to believe." [2]

Most Western sociologists regard the social changes brought about by the scientific and technological revolution as resulting from the transformation of capitalist society into a qualitatively new "industrial society" (J. Galbraith), "a developed industrial civilization", "a cybernetic-electronic", or "cybertronic society" (Z. Brzezinski), or even a "postindustrial society" (J. Bell). All describe the process of social development as a smooth evolutionary development, attending technological progress, toward a new social system which automatically eliminates the fundamental contradictions that characterize modern capitalism.

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[1] Markham (Ed.). *Jobs, Men and Machines,* N. Y., 1964, p. 10.
[2] *Ibid.*, p. 13.

Herbert Marcuse, for example, believes that at its present scientific and technological level the developed industrial society can overcome or neutralize, or at least curb, its basic contradictions which half a century ago pushed the capitalist world to the edge of disaster.

In the past there were prominent Western sociologists who believed that scientific and technological progress and economic growth would, on their own, eventually resolve the problems that lie at the root of discontent and social conflict. Now this view is heard much less frequently.

It has been shown that in all the major social processes brought into being by the scientific and technological revolution developing within the framework of capitalist relations, which are based on the exploitation of hired labour and on class antagonism, conflict is a principal characteristic.

Recent history has fully borne out the correctness of the conclusion made at the International Meeting of Communist and Workers' Parties in 1969 that "the scientific and technological revolution accelerates the socialization of the economy; under monopoly domination this leads to the reproduction of social antagonisms on a growing scale and in a sharper form. Not only have the long-standing contradictions of capitalism been aggravated, but new ones have arisen as well. This applies, in particular, to the contradiction between the unlimited possibilities opened up by the scientific and technological revolution and the roadblocks raised by capitalism to their utilization for the benefit of society as a whole. Capitalism squanders national

wealth, allocating for war purposes a great proportion of scientific discoveries and immense material resources. This is the contradiction between the social character of present-day production and the state-monopoly nature of its regulation. This is not only the growth of the contradiction between capital and labour, but also the deepening of the antagonism between the interests of the overwhelming majority of the nation and those of the financial oligarchy." [1]

As we have mentioned, the scientific and technological revolution has given a new impetus to the concentration and centralization of capital. As required by technological progress, the process of private-capitalist socialization of the economy is expanding, linking up with the developing process of state-monopoly socialization.

As a result, the powerful productive forces which are social in character, and which possess tremendous potential for increasing production and reducing its cost, eventually fall into the hands of an ever diminishing number of monopolists, whose motives are determined solely by considerations of profit and by the interests of the capitalist system as a whole. Therein lies the root cause of conflict in the social processes brought into being by the scientific and technological revolution which clashes more and more with capitalist production relations.

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[1] *International Meeting of Communist and Workers' Parties*. Moscow, 1969, p. 19.

Science and technology vs. man

One of the sharpest conflicts of our time and one which is fraught with grave danger for mankind stems from the growing contradiction between the humanistic goals of science and technology, on the one hand, and the utilization by imperialism of the advances of science and technology for aggressive military purposes and for manufacturing ever more destructive weapons, on the other.

In capitalist countries the greatest scientific discoveries have first been applied in the military field. The discovery of nuclear fission was first put to use in the atomic bomb, and of nuclear fusion, in the hydrogen bomb. In the field of electronics the first result was radar. In most capitalist countries, the scientific and technological revolution has been first and foremost a military technological revolution. The efforts of the reactionary military circles to create, accumulate and continue to develop ever more powerful weapons of mass annihilation are a tremendous burden on mankind. In the United States, two-thirds of all expenditure on scientific research is financed by the state and is for the most part directed towards military purposes. The extent of the military orientation of research is even greater than that indicated since much military research is disguised by being included in the "peaceful" research programme.

The steadily growing military expenditure of the advanced capitalist countries testifies to the growing militarism of these countries. In the years of the existence of the NATO organization the military expenditure of its members has grown by 5.5 times. In the period 1960-68, alone, the NATO countries spent more than 800,000 million dollars for military purposes, which is a great deal more than the annual national income of the United States, and twice the combined national incomes of all West European countries for 1968.

Such colossal military spending is serving to consolidate the dangerous alliance between science, the military, and the entrenched monopolies. The military-industrial complex, which is exerting an ever more powerful influence on the foreign policy and economic and political life of a number of capitalist countries, is waxing fat on state contracts. Imperialism is forcing a massive arms drive upon the people and is generating the threat of a thermo-nuclear war which could take hundreds of millions of human lives and lay waste whole countries.

Some Western economists have talked of the "beneficial" effect of military expenditure on economic and technological progress. Of course, up to a certain point military orders serve to stimulate production. But militarization of the economy disfigures and curbs the development of the productive forces, something that has been admitted by prominent Western economists. According to Professor Kenneth E. Boulding "...the US Department of Defense does a great deal of economic damage to the United States: it reduces domestic consumption by about fifteen per cent, and, by diverting the growth resource into the rat hole of competitive weapons systems, or even space technology, it diminishes the annual rate of economic

growth, probably by as much as two per cent." [1]

Militarism not only turns the advances of science and technology against man but also reduces production efficiency. There is nothing accidental in the fact that some advanced capitalist states which spend proportionally less for military purposes (Japan, for example) enjoy higher production efficiency.

Arms manufacturing deflects a large amount of skilled labour from peaceful endeavour, with consequent damage to other sectors of the economy. An economic report of the late President Kennedy reads in part: "The defence, space, and atomic energy activities of the country absorb about two-thirds of the trained people available for exploring our scientific and technical frontiers. . . .But in the course of meeting specific challenges so brilliantly, we have paid a price by sharply limiting the scarce scientific and engineering resources available to the civilian sectors of the American economy." [2]

The high and increasing level of military expenditure is one of the main reasons for the deficit in the national budgets of the capitalist countries, and for their inflation and currency crises.

More efficient exploitation of hired labour

Although equipped with the latest means and advanced technology, the process of capitalist production does not cease to be a process of exploitation of hired labour and creation of surplus value. In the course of the scientific and technological revolution the methods of exploitation change, and the work force which creates the surplus value takes on different forms, but exploitation—the essence of the process—itself remains unchanged. At the same time the concentration of capital and its depersonalization, and the higher qualifications and rising educational and cultural level of the working class, enable the working people as a whole to better understand the essential nature of the process of capitalist exploitation, thus increasing their class awareness.

To increase the efficiency of its exploitation capitalism introduces more complicated forms of the labour process, more efficient means of production, and advanced methods of labour organization. Taking into consideration the present-day level of development of the productive forces and the growing intensity of the class struggle, the capitalists as a rule avoid any direct lowering of wages and, instead, seek to reduce production costs by raising productivity and increasing the intensity of labour. Between 1947 and 1965, real wages of industrial workers in the United States grew by 41%, while hourly output in the manufacturing industry more than doubled, and in the mining industry increased by almost 2.5 times. Over the five years 1960-65, average real wages in the manufacturing industry rose by 11.5%, while net profits after tax grew by 80.5%.

From 1965 to 1970, inflation and military spending gave rise to a tendency towards low-

[1] *American Militarism 1970,* N.Y., 1969, p. 91.
[2] *Economic Report of the President Transmitted to the Congress,* January, 1963, p. XXV.

er real wages in industry, although labour productivity rose by 10 per cent over this period. The emergency measures to stabilize the American economy and to save the dollar, announced by the President in 1971, opened up new possibilities for the exploitation of the working people. One of these measures was the "wages and prices freeze". The second phase of the government emergency measures, beginning in November 1971, was the "curb on wages and prices" policy. These measures were aimed at holding down wages and did not affect the capitalists, who in fact increased their profits.

The scientific and technological revolution, while creating new industries and new spheres of human activity, at the same time releases more of the work force from production. It has been pointed out that the contradictions of the capitalist system of economic development have created a situation where the supply of new jobs does not keep pace with the tendency towards replacement of the work force by machinery. Capitalism has failed to ensure the stable growth of consumption of goods and services, the required advance in education and training and the reduction in working hours necessary for the fullest possible utilization of labour resources in the conditions of the scientific and technological revolution, and is thus faced with a growing problem of unemployment.

In addition, there is an objective need for a conscious and responsible attitude to work, and for independent and creative thinking and initiative on the part of the worker. But tending to promote the opposite are the capitalist's oppressive methods of management, the problem

of alienation, and the tyranny of the monopolies. Despite the introduction of various "partnership" systems which pretend to give labour a say in management, the capitalist owners of industry have no intention of giving up their prerogatives and accepting the real participation of workers in industrial management.

The era of automation opens up great possibilities for a comprehensive development of the human personality, and for the unprecedented expression of man's creative spirit. However, these possibilities cannot be realized in conditions where the working people continue to be a little better than wage slaves. The technological emancipation of man brings to the forefront his need for economic and political emancipation.

Economic regulation by the monopolies and by the state

The scientific and technological revolution, which is characterized by growing investments and output, by increasing specialization of labour and production, and by the rapid and extensive socialization of the means of production, necessitates planning on a nation-wide scale.

With a high level of development of the productive forces, and when personal consumption and the development of man himself assume a new dimension, the planning of social as well as economic processes, becomes an objective necessity. Scientific and technological progress

has raised major social problems in areas which call for long-range planning.

However, state-monopoly capitalism, with its uncontrolled market, excludes national economic planning, which is possible only under socialism. Planning within the framework of individual corporations is of a strictly local character and cannot affect, to any sizeable degree, a national economy where capitalist competition is the predominant factor.

Great as economic interference by the state is, it is not without its limits. The capitalist state is not equipped to carry out comprehensive national planning. For the regulation of the economy, and for economic programming, the state is limited to the use of monetary, credit, fiscal and other indirect means. The growth of state property offers wider possibilities for economic programming. However, private property reigns supreme, assigning to state property a place of secondary importance in the economic system of capitalism.

State-monopoly programming and regulation of the economy remains limited and contradictory because it is effected in the interests not of society as a whole, divided as it is into antagonistic classes, but only in the interests of certain financial groups.

State-monopoly capitalism, by its very nature, is unable to combine the development of science, technology and labour resources, the growth of capital investments, production, services and personal incomes, or the development of public education, culture, the public health service and environmental protection into one planned and

regulated process. Even less can it make this process serve the interests of peace and social progress.

Aggravation of contradictions in the cultural sphere

The scientific and technological revolution has for the first time made man's cultural development a necessary adjunct to the development of production. Science and education have become major productive forces. This means that not only material but also cultural requirements have gained in importance. However, as capitalism develops, its characteristic contradictions affect not only the material sphere but the non-material as well.

The achievement of an equal distribution of the cultural wealth accumulated by society becomes even more of a problem. Although a certain degree of progress has been achieved in the sphere of public education and occupational training, the gap between the existing system of education and training on the one hand, and the objective requirements of scientific and technological progress, on the other, is growing even in the most advanced capitalist countries. This widening gap calls for nothing short of a revolution in the cultural field, for education, especially at its higher stage, is still largely the monopoly of the propertied classes, and is mostly out of reach of the mass of the people. In the United States, for example, in 1960, only 9% of young people from families with an annual income of 5,000 dollars or less were able to attend college, whereas in the case of fami-

lies with an annual income of 10,000 dollars or more, the figure was 44%.

Full secondary education has become a necessary condition for the acquisition of new skills by workers and for raising the mobility of the labour force. However, in many instances, schools in capitalist society, limited as they are by considerations of social exclusiveness, and suffering from a chronic shortage of funds, cannot meet the necessary standards for an adequate secondary education. In many working-class families the desire of parents to give their children an education clashes with the need to start work as soon as possible in order to supplement the family income. It is indicative that in 1967, only 62% of children finished secondary school in France, while in Italy the proportion was 52%, and for the Federal Republic of Germany it was 65%.[1] Finally, the capitalist-created system of on-the-job training, which serves narrowly utilitarian needs, falls short of the requirements of a broad work training resting on a solid theoretical basis.

Capitalism needs skilled and educated employees, for it uses their knowledge and experience and turns them into a productive force. On the other hand, this productive force, which, under present conditions is expensive to create, is an inalienable part of man himself and cannot be a mere possession of the capitalist. Herein is reflected the deeply social character of education and work skill.

John Galbraith correctly noted that "...the high return to scientific and technical training

[1] *UNESCO Statistical Year Book*, 1969.

does not cause the funds to move from material capital to such investment. ...Here, at the most critical point in the vaunted process of investment resource allocation, is an impediment of towering importance." [1]

The monopolies are trying to resolve this contradiction by putting the burden of training on the state. However, the efforts being made in this direction are not succeeding in meeting requirements, mainly because the state budget is overburdened with military expenditure. Although the number of students is growing, the system of education and training based on class privilege is adjusting to the new conditions very slowly.

It is this position that is responsible for the shortage of skilled personnel in many capitalist countries. In France, for instance, the shortage of trained engineering and technical personnel was such that for a number of years the industrial needs of the country could not be met. According to the French Labour Force Commission, it was expected that more than 200,000 workers a year would be trained, whereas in the second half of the 1960s only half this number received the necessary training. The Commission also found that, in 1975, the requirement for personnel with a university education would be only 61% satisfied, while the demand for other specialists with a higher education would be only 45% satisfied.

Much has been said in academic circles in the capitalist countries about the crisis in public education and occupational training. Most cri-

[1] J. Galbraith. *The Affluent Society*, Boston, 1958, p. 273.

ticism, however, while concentrating on particular, and, undoubtedly, important aspects of the problem, steers clear of the social causes of this crisis. Now that the scientific and technological revolution has greatly increased the importance to society of cultural progress, the gap between the growing productive forces and the cultural barrenness cultivated by capitalism is especially noticeable.

The monopoly of corporations and private industry on scientific and technical knowledge in the conditions of present-day state-monopoly capitalism has created a dangerous situation in which scientific discoveries may be used for tightening control over the population and establishing authoritarian regimes in which the finance oligarchy will command a dominant position.

The correctness of Lenin's words that "capitalist technology is increasingly, day by day, *outgrowing* the social conditions which condemn the working people to wage-slavery," is now more clearly evident than ever before.

The gap between scientific progress and social progress

The great majority of the population of the capitalist world cannot avail themselves of the full benefits of scientific and technological progress. Poverty afflicts a considerable proportion of the population of the United States, the richest capitalist country, with the highest labour productivity in the world. According to US official statistics for 1971, one out of every

eight Americans was classified as living in poverty, while the proportion among the Negroes was given as 33.6%.

This contradiction is still more glaring if viewed against the background of the world capitalist system. In spite of the achievements of modern science and technology more than two-thirds of the population of the countries of Asia, Africa, and Latin America use basically the same instruments of labour as their forbears hundreds of years ago. They live in unbelievably primitive conditions, often on the verge of starvation and prey to devastating epidemics.

The capitalist world is drawing the developing countries into the process of the scientific and technological revolution not as its equal and active partner but as its passive object. These countries are not able to benefit as they should from the achievements of scientific and technological progress because of their archaic forms of social relations, general technical and economic backwardness and, finally, because of the policy of the monopolies of the advanced capitalist countries aimed at perpetuating this backwardness. As a result scientific and technological progress only deepens the gulf between the developing and industrially advanced countries of the capitalist world. In 1950 per capita output in the countries of Asia and Africa was 7-10% that of the advanced capitalist countries, while in 1969 it had fallen to 6-8%.

The dual, contradictory nature of scientific and technological progress under capitalism in the developing countries takes particularly dis-

torted forms, giving rise to the poor use of labour resources, poverty, starvation and mass illiteracy and to a rapid increase in the size of the population.

UNESCO statistics reveal that in 1950, 80-85% of the adult population of Africa, 82-87% in the Arab countries, and 67-71% of the population of Asia and Oceania were illiterate.

The illiteracy rate in the developing countries is growing because the provision of schools lags behind the natural population growth and also because large numbers of pupils leave school before completing the primary course. Secondary school education remains largely out of reach of the working people of these countries.

By the middle of the 1960s about 70% of African countries had failed to provide secondary school education for more than 90 per cent of the children of school age, i.e., they had failed to reach the minimum which specialists believe is necessary to ensure a country's independent economic development.

The gulf between scientific and technological progress in the capitalist countries and their social, cultural, and political development is widening all the time. The most outstanding example is the United States, a country which has gone far ahead of all the other capitalist states in the utilization of the latest achievements of science and technology and the organization of production. In reply to Servan Schreiber, who is extremely enthusiastic about things American, Professor R. Hailbroner of the United States points to such negative aspects of the socio-economic life of his country as the dogma of "un-

inhibited expansion", lack of economic planning, and growing power without a corresponding growth of responsibility. The US magazine *Future* lists these negative aspects of the American way of life: the high rate of unemployment, the high cost of medical service, the large proportion of the poor, widespread illiteracy, crime, and the high incidence of mental disease.

The harmful effects of the scientific and technological revolution under capitalism aggravate capitalism's social evils. Mass dismissals in the United States and other capitalist countries, the obsolescence of whole industries, professions and trades, expropriation of farmers and their flight to the cities, the transfer of the work force to lower paid branches—all worsen the problem of poverty and create social unrest and anger, which inevitably leads to crisis situations and struggle against the system of capitalism.

Economic growth, but socio-political crisis

Theoreticians of monopoly capitalism believe that the way out of the acute contradictions in capitalist countries stemming from the scientific and technological revolution lies in the further control by the state of the economic and social life of society. But state-monopoly capitalism shows with increasing clarity its inability to resolve the problems of the scientific and technological revolution in the interests of the working people.

The record shows that the wide application of the achievements of science and technology, and the growth of production and its growing efficiency cannot, of themselves, resolve the acute social problems that confront the advanced capitalist countries without effecting fundamental changes in production relations. On the contrary, lacking such change, technological advance creates new problems.

It is worthy of note that the enthusiasm with which scientific and technological progress was greeted by many Western economists and sociologists in the 1950s has now given way to a less optimistic mood. For example, the well-known French sociologist, Raymond Aron, in his book with the provocative title, *Les désillusions du progrès,* writes: "The deep-going reasons for the pessimism which I observe and which I feel, manifest themselves in the contradictory nature of all the major projects of our time." [1] He goes on: "The obstacles which block the Promethean desire to see the birth of a new man or the flowering of each man's personality have not only become still more formidable but have changed in character." [2]

The terms "affluent society", and "welfare state", previously used by Western authors to describe the modern capitalist society have vanished and been replaced by such terms as "the sick society", "explosive society", etc.

The scientific and technological revolution in the leading countries of capitalism has been

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[1] R. Aron. *Les désillusions du progrès. Essai sur la dialectique de la modernité.* Paris, 1969, pp. VII-VIII.
[2] *Ibid.*, p. 290.

instrumental in precipitating an acute socio-political crisis, which is characterized by:

— growing inflation, mass dismissals, and growing instability of the position of the working people;

— mass opposition of the working people to the continuing build-up of armaments, to the cut-backs in social reform programmes, to the aggressive actions and policies of imperialism;

— widespread public protest against the wanton and destructive exploitation of natural resources by the big industrial corporations whose operations threaten to destroy the natural environment necessary to sustain human life;

— super-urbanization, aggravating the socio-economic problems of the cities;

— mounting racial and ethnic problems;

— organized crime, which has assumed alarming proportions;

— growing disillusionment of the public with the "consumer society";

— mounting discontent of the working people with the growing centralization and bureaucratization of economic and political life, infringement of democratic freedoms and failure to provide for the participation of workers in industrial management;

— a spreading strike movement, including "wild-cat" strikes; in some countries mass strike action led by the working class is spearheaded against not only individual capitalist groups but against all state-monopoly domination;

— participation of new social groups of the population in strikes;

— widespread discontent among the youth.

New developments in the class struggle

The scientific and technological revolution has had a great impact on the conditions in which the class struggle is being waged. In their effort to present the process of social development as a smooth evolution without conflict towards a post-industrial society, as an outgrowth of the scientific and technological revolution, sociologists of the capitalist world have declared the struggle of the working class and of all mass organizations to be a thing of the past. For example, Professor Galbraith believes that in the new industrial society the trade unions will inevitably forfeit their role as the result of the transition of power from property owners to a kind of technostructure, and as a result of the state control of the markets, the total demand, and the wages and prices. The author of the "technotronic society", Zbigniew Brzezinski, for his part, has declared that no unifying ideology of political action is possible in this society.

In his book, *One-Dimensional Man,* Herbert Marcuse calls members of the working class the sublimated slaves of an advanced industrial civilization, depicting them as being fully integrated in the capitalist system both as regards production and social consciousness. He writes: "The new technological work-world thus enforces a weakening of the negative position of the working class: the latter no longer appears to be the living contradiction to the established society." [1]

[1] H. Marcuse. *One-Dimensional Man,* Boston, 1968, p. 31.

In actual fact, reality is not nearly as one-dimensional as described by Marcuse. As a result of the changed balance of world forces in favour of socialism the working class of some capitalist countries has gained a notable rise in real wages. This may create false illusions about the possibilities of capitalism, illusions that are being strengthened by ideological pressure on the minds of working people through the monopoly-controlled mass media. Besides, the proportion of what Lenin called "politically unaware proletarian groups" is increasing within the working class itself. In this situation a certain section of the working class may be led astray and drawn into the policy of class collaboration with the bourgeoisie and in fact integrated into the system of state-monopoly capitalism. As a rule, however, this situation does not last long and eventually changes under the pressure of more permanent factors which cause the continuing and growing class struggle to spread to ever new groups of the working population.

Marx and Engels, in the 19th century, wrote that "the bourgeoisie cannot exist without constantly revolutionizing the instruments of production, and thereby the relations of production, and with them the whole relations of society." [1] The sharpening contradictions of capitalism as the result of the scientific and technological revolution bear out the correctness of this conclusion. Social conflicts which emerge out of this revolution should not be regarded as isolated phenomena, for they reflect the

[1] K. Marx, F. Engels. *Sel. Works,* Vol. I, p. 111.

deep structural crisis of capitalist social relations, which conflict with the new productive forces created by the scientific and technological revolution. The class struggle, which is not subsiding and which cannot be halted, despite the manoeuvering of state-monopoly capitalism, is the ultimate expression of these fundamental contradictions.

Over the past 10-15 years most of the major strikes in the United States have in one way or another been linked with the protest of the working people against the harmful effects of technological progress. Professor Jack Barbash of the University of Wisconsin writes: "The recent period has undoubtedly seen an increase in strikes that focused on issues with a technological tinge. There is the possibility that technology as a factor in recent major strikes may 'be gathering momentum'." [1]

The negative effects of scientific and technological progress, coupled with racial discrimination, hit the Negro working people especially. Also outside the pale of technological progress are many young people without the necessary training that would enable them to live and work in the age of "big-time" science and technology.

Consequences of the scientific and technological revolution loom large among the factors behind mass student revolts. The problem of employment is of special concern to young people, because unemployment among the youth in many capitalist countries is higher than the

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[1] G. Somers, E. Cushman, N. Weinberg, (Ed.). *Adjusting to Technological Change,* N.Y., 1963, p. 51.

average level of unemployment. The political awareness of students is to a great extent influenced by the fact that middle-class employees such as engineers, technicians and office workers are tending to move closer and closer towards the working class. Students are reacting sharply to the militarization of science, to police repression and to the suppression of democratic freedoms, the responsibility for which rests with monopoly capitalism. Having found modern life the way it is, young people are much less inclined than the previous generation to be deluded by the "consumer society" picture painted by capitalist propaganda.

Belgian Professor Brugmans recently wrote that the class struggle as such is obsolete, that there are no longer people willing to fight barricade battles. Soon after, however, barricades blocked the streets of Paris and many cities and university centres of Europe and America.

In May, 1968, student revolts paved the way for the biggest post-war strike in France. It involved ten million people who, besides demanding higher wages, pensions and unemployment benefits, and a shorter working week also put forward demands for broad guaranteed trade-union rights and democratic reforms in the fields of education and occupational training.

The May crisis in France reflected the widespread discontent of the working people not only with material inequality and hardship but also with the caste structure of bourgeois society, with the fact that most of the population has no share in the cultural benefits of society and is excluded from social and state affairs.

The contradiction between labour and capital remains the main contradiction of capitalist society. In the conditions of present-day state-monopoly capitalism this contradiction is becoming increasingly manifest, not only in conflicts between workers and management at a particular factory or group of factories, but also in the opposition of working people to the bourgeois state as a whole.

The new situation calls for a different approach to the question of class forces. The alliance of the working class with the petty bourgeoisie of cities and villages is just as important as it was before. In the advanced capitalist countries, however, the strengthening of the alliance between the working class and office employees and other white-collar workers, and also new proletarian groups, is gaining in importance. Without this alliance the working class movement in the developed capitalist countries would not be able to retain, much less strengthen, its influence on socio-political life.

The changes in the economic and social position of office employees, engineers and technicians have created objective conditions for the active participation of these groups in the anti-monopoly struggle. The past several years have seen active support being given to the working class by office employees and progressive elements from among the group of engineers, technicians and other specialist personnel. These white-collar workers have become especially active in the struggle against the aggressive policies of their governments and in other major class battles of a political character.

The reactionary press tries to present the po-

sition of the working class with regard to technological progress as conservative and backward, although nothing could be further from the truth. The modern working class movement has gone a long way from the Luddites of the 18th century who set out to destroy machines. The working class is not against technical progress as such but against its utilization for adding to the profits of the monopolies and furthering their aggressive plans. The working class demands that technological progress be accompanied by social progress. This struggle of the working people is becoming an increasingly important part of the anti-monopoly struggle.

The experience of recent years clearly shows that the gains scored by the working people of the capitalist countries have not weakened their will to fight, but, on the contrary, have raised the class struggle to a still higher level. In the new conditions which have arisen as a result of the scientific and technological revolution, the working class and its revolutionary vanguard—the Marxist parties—are faced with the need to put forward new demands, and evolve new forms and methods of struggle.

Evolving the new strategy and tactics of the working-class movement involves such questions, for example, as the effectiveness of strike action, and of the system of collective agreements, as a method of struggle of the working class in defence of its interests in the conditions of automated production.

Some American economists and representatives of the trade-union bureaucracy have claimed that automated production reduces the effecti-

veness of strikes.[1] As evidence they refer to the unsuccessful strikes at a number of highly automated enterprises in the late 1950s when 3,700 workers at the *Gulf Oil* refineries at Port Arthur, Texas, went on strike, but failed to stop production which continued at 65% of the normal output with the help of 600 administrative and supervisory personnel. The same thing happened at refineries of the *American Oil Co.* and *Standard Oil of Indiana,* and at a factory of the *Bell Telephone Co.*

These examples can hardly serve as evidence of the ineffectiveness of strikes. As is well known, no industrial enterprise today, whatever its rate of automation, can be run without people. It must also be borne in mind that the costly automated equipment makes stoppages tremendously expensive for the owners. Many strikes at factories and plants using the latest technology (*Ford* and *General Motors*, for instance) have ended in victory for the workers. All of this goes to illustrate not the ineffectiveness of strikes in general, but the ineffectiveness of local, isolated actions. With the high level of mechanization and the tremendous scale of the capitalist socialization of production, industrial action is likely to be successful only when it is taken by the whole of the working class and is supported by all its sections, when all its groups are united by bonds of mutual assistance. It is clear from the example quoted above that none of the automated oil refineries would have been able to operate for any length of time had the strike been supported by the majority of office workers and technical personnel at these enterprises, or had the strikers been supported by the workers of associated industries, by transport workers, etc.

Over the past several years, much has been written to the effect that the problems raised by the scientific and technological revolution allegedly cannot be resolved by organized workers, on the one hand, and management, on the other, through collective agreements, that the part played by such agreements in the class struggle of the proletariat is losing its significance. But the truth is that the working class struggle over collective agreements waged in traditional forms is just as important as it has ever been in curbing the rapacity and pressure of the monopolies. More than that, the collective agreement is becoming an increasingly effective weapon in the hands of the working class, while the successful defence of the class interests of the working class in the conditions of the scientific and technological revolution necessitates that the workers' demands advanced in the course of their economic struggle should cover a still wider field.

Of foremost importance is the struggle for the right to work, the right to guaranteed employment. The trade unions are demanding that the adoption of new technology does not entail mass dismissals. The main problem arising during collective bargaining in the leading industries of some capitalist countries over the past several years has been job security for the workers. Trade unions are seeking measures

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[1] J. A. Beirne. *New Horizon for American Labor,* Washington, 1963; B. J. Widick. *Labor Today,* Boston, 1964.

aimed at preserving and even increasing the number of jobs, at reducing the working week without pay cuts, at lowering the pension age, at raising pensions and severance pay, and securing longer paid leave, etc.

Workers are demanding that the more complicated labour processes, and the higher qualification standards required of them today be reflected in the time-and-pay schedule. The trade unions, too, are demanding that workers be compensated for the time they have spent on their training, and for the nervous tension resulting from the growing responsibility and additional strain resulting from various specific conditions of the modern production process. The trade unions also demand that the cost of training and, where necessary, re-training workers be met from company funds under trade-union control. The major changes in the division and organization of labour caused by the adoption of new technology and its utilization in the interests of the capitalist, and the pressure that the management is bringing to bear upon the workers have turned numerous problems of a purely local character into important issues behind the class struggle.

The struggle between workers and factory owners ranges over such problems as quotas and classification of work, rates of pay, the hiring and dismissal of workers and their transference from one job to another at factories, speed-up, the length of rest intervals, the procedure to be adopted in labour-management disputes, and pensions, insurance, etc. Thus the question is that of reflecting and formulating all aspects of labour relations in collective agreements and of giving more extensive rights to workers' organizations at factories.

The application of the means of production, highly efficient and social in character, which the monopolies use to increase profits, necessitates the exercise of public control over the use of new technology, as well as the participation of workers in industrial management. These demands, which affect the "sacred" prerogatives of factory owners, are fiercely resisted by the monopolies, so that workers' organizations are compelled to strengthen their class positions at factories, to fight for their rights, and to penetrate deeper into the mechanism of production organization, separating its positive scientific aspects (the result of the progressive development of productive forces) from the negative, exploitative aspects resulting from the capitalist nature of production.

The growing internationalization of capital serves to strengthen the international solidarity of the world's workers and increases the need for a world-wide strategy of the working class. This need has become especially great of recent years, due to the rapid growth of world corporations which derive great advantages from the diversity of wage levels and social benefits in different countries.

The first attempt to develop united trade-union tactics with regard to international corporations was made in the automobile industry. Union representatives of the auto industry from 19 countries met in London at the beginning of 1971 to lay down the guidelines of international trade-union strategy for collective agreements. This strategy provided for the coordination of

wage agreements at all factories and plants owned by international corporations, including the term of operation of these collective agreements.

Thus, in the new conditions that have come about as a result of the scientific and technological revolution, collective agreements between trade unions and factory owners continue to be an important weapon of the proletariat in the class struggle. Great as their role is, however, collective agreements alone cannot resolve the main problems of the scientific and technological revolution, which call for major social changes. Collective agreements and "business unionism" cannot raise the general level of employment, cannot provide young people with jobs, end poverty, put college education within the reach of all, etc. By their very character and scale the new problems that have arisen as a result of the scientific and technological revolution necessitate putting the working class struggle on a political footing, directing it not only against individual monopolies, but against the capitalist system as a whole. In these conditions the old demands take on a new meaning and call for a new approach. The traditional demand for higher wages is one example, for here the scientific and technological revolution opens up new possibilities. In the first place it requires that the working people have considerably greater purchasing power. The struggle for higher wages has become an important tool in the hands of the working class to prevent the monopolies from appropriating the savings and additional profits resulting from the scientific and technological revolution. In its

struggle for higher living standards the working class comes up against the resistance not only of individual capitalists, but of the capitalist state which follows the "income policy". What the working people need in these conditions is the democratization of state economic programming with effective worker control over prices and monopoly profits. The working class leads the struggle for free access of working people to all types of education and for a broader and better system of work training.

The struggle for full employment, higher wages and democratic freedoms calls for radical reforms, such as nationalization of the key industries so that they are brought under public control, especially the new industries which are developing with economic assistance from the government, and the adoption of a democratic system of state economic programming as a step towards a programme of a genuine restructuring of society as demanded by all progressive forces.

The utilization of science and technology in the name of social progress is inseparable from the demand for the all-round democratization of the economy, for the genuine participation of the working people in economic and industrial management at all levels and for broader rights of workers' representative bodies. The objective conditions for the realization of these demands have been prepared by the growing socialization of capitalist production and by the rising level of education and skill of the workers.

The class battles are reaching their crucial stage, threatening the very foundations of capitalism, because the scientific and technological

revolution demands not partial concessions and reforms, but drastic revolutionary changes in the character of social relations.

7. THE SCIENTIFIC AND TECHNOLOGICAL REVOLUTION. SOCIALISM AND COMMUNISM

The scientific and technological revolution of the mid-20th century is developing both in the countries of capitalism and socialism, and looms prominently in the competition between the two main social systems.

This economic competition is for higher labour productivity which, as Lenin put it, is of ultimate importance for the victory of the new social system over the old. This competition, of decisive significance for the future of mankind, has put to the test of history the viability of the two systems of social production run on completely different principles.

As is known, the development of the productive forces of society hinges on the dominant production relations which generate the driving force characteristic of these relations, and also the specifics and the social consequences of the use to which the achievements of the scientific and technological revolution are put.

Advantages of socialism

More than fifty years of experience has shown that socialism has important advantages over capitalism in the rapid development of science

and technology and creates optimal social conditions for their progress. Social ownership of the means and instruments of production provides new incentives for more productive labour and more active utilization of the achievements of science and technology in the interests of all working people. An important role in this respect is played by national economic planning. The planned regulation of scientific and technological progress in all its aspects under socialism is an important and inseparable part of the general planning of all economic and social processes. The material and financial resources of the state are concentrated on the most promising and effective areas of scientific and technological progress with the object of achieving the harmonious development of science, technology, production, consumption, culture and education.

In the early years of Soviet rule, when the country was economically backward and had not yet recuperated from the effects of the war, Lenin initiated the Plan for the Electrification of Russia (GOELRO). Even a man as imaginative as H. G. Wells considered the plan to be unrealistic. Nevertheless, this first long-range plan for scientific and industrial development, which also took into account various aspects of the economic and social development of the country, was carried out ahead of time.

In later years the national economy was planned with a view to raising the technical level of production. The planning of scientific and technological progress was also improved as part of the general long-term planning of the national economy.

Since the adoption of modern scientific and technological achievements requires large outlays, the problem of financing is of great importance for securing a high rate of technological progress. Here the socialist system has important advantages over capitalism. It is sufficient to point out that the rate of growth of the national income—the main source of wealth in socialist society—is much higher than in the capitalist countries. For example, it took the United States twenty years to double its national income, Britain, more than thirty years, and the Federal Republic of Germany, almost fifteen years, whereas the Soviet Union, with its tremendous scope of social production, took only ten years.

With no exploiting classes left in the country, with no parasitic consumption, the planned character of the socialist economy enabled it to channel a large proportion of the national income into development and at the same time to achieve a steady rise in living standards.

With the development of the socialist economy, capital investments are also growing. Between 1966 and 1970, 352 thousand million roubles were invested in the national economy, almost the same amount as the total investments for the previous eight years. Whereas the United States took 22 years to double its basic production assets, Britain, 19 years, and the Federal Republic of Germany, 10 years, the Soviet Union did so in eight years.

The rapid rate of capital investment in the Soviet Union has created favourable conditions for further raising the level of production and for building new industrial establishments

equipped with the latest machinery and employing advanced technology.

The advantages of the socialist system can also be seen in the organization, planning and financing of research work and the fact that research can more readily be directed to meet practical requirements. Under socialism the achievements of science are put to good use not only in the sphere of production, but also in the vast sphere of social change.

Socialism has proved that it can create conditions for the effective planning of scientific development, ensuring a rational division of work between the various branches of research, and that it can guide this development in the best interests of society.

Under socialism no individual or industrial enterprise can claim a monopoly on scientific achievements or on their utilization in production. The discoveries and inventions of Soviet scientists and engineers are used for the benefit of society as a whole, and their planned adoption in the national economy results in tremendous savings.

The direct interest of all workers in the results of production, which are used for the benefit of all, lends a mass character to the suggestions and inventions movement in the Soviet Union. For example, in 1972, some 3.6 million inventions and work-improvement suggestions were introduced into the national economy, bringing a saving of over 3 thousand million roubles a year.

Scientific and technological progress is impossible without a large body of skilled specialists. This requirement is met by socialism, which has

wrought revolutionary changes in the educational field, raising the general educational level and making higher education widely accessible. In 1972 the number of qualified engineers employed in the Soviet economy was almost three times as great as in the United States. In the 1971-72 school year the USSR had a total of 4,597,000 students. The Soviet Union has 25% of the world's research and laboratory workers.

Rapid scientific and technological progress

Socialism as a new and more progressive mode of production has created conditions for a still higher rate of scientific and technological progress. In a brief span of time, as history goes, and despite the enormous losses caused by two world wars and the Civil War, the Soviet Union has grown from being a country with a backward economy, science and technology, into an advanced industrial state, the world's second industrial power.

Soviet science has advanced to the highest levels and is unsurpassed in certain key areas of research, such as rocketry, space research, nuclear physics, etc.

Extensive theoretical work in the field of science has yielded spectacular results, for example, the world's first atomic power station which was put into operation in Obninsk, near Moscow, in 1954. Subsequently, several more such stations, using different types of nuclear reactors, were built. At present, a highly economical reactor of a new type, employing high-speed neutrons, has been developed. Its main

advantage is that it produces more nuclear fuel than it consumes. This characteristic makes it possible to use natural uranium, instead of only its radio-active isotope, Uranium-25, of which there is no more than 0.714% in the natural ore. Work is nearing completion on the construction of a nuclear power station operating on high-speed neutrons in the town of Shevchenko (Kazakh SSR). Besides generating electricity the station will also be used for salt-water distillation.

Scientists in many countries are working on methods of controlling nuclear fusion and the problem of taming and turning to peaceful uses nuclear energy which has hitherto been used only in the form of the hydrogen bomb. The solution of this problem would open up almost unlimited sources of cheap power.

The work of Soviet scientists in this important field of research has won world-wide recognition. Using the *Tokamak* installations, Soviet physicists have generated and studied a stable plasma with a temperature of 7,000,000 degrees C.

In 1957 the Soviet Union launched the world's first artificial earth satellite and, four years later, the Soviet cosmonaut Yuri Gagarin became the first man to orbit the Earth in a spaceship. The Soviet Union leads the world in solar-space inter-planetary research, using automated probes for this purpose. Space research is of tremendous practical importance for the solution of terrestrial problems. Earth satellites are used by the USSR for navigation, weather forecasting, and for relaying television programmes to remote areas of the Arctic, the Far East

and Central Asia (the *Orbita* system). The new materials, technological processes, instruments and devices employed in space probes are now used in many other fields as well. For example, the micro-miniaturized electronic equipment developed by space research has led to dramatic advances in computer design.

Spectacular results have been achieved in quantum electronics. In 1954, the Soviet Union developed its first laser beam which has since been widely used in metal-working, chemistry, medicine, and communications.

The Soviet Union has made considerable progress in the development of automatic systems. Significantly, the Soviet Union was the first country in the world to put the production of automobile pistons onto a fully automatic basis in 1950. Western specialists who attended the Congress on Automation in Moscow in 1959 praised the high standard of automation at many Soviet industrial establishments. The magazine *American Machinist* wrote: "Western experts were flabbergasted by Soviet achievements in automation shown at the First International Congress on Automation held in Moscow. The Russians have skipped the intermediate steps the West had to make. The consensus of Westerners after touring the Soviet Institute of Automation and Telemechanics was that it was far ahead of anything in the West. 'We've been a bit shattered,' said one Western delegate. 'We never dreamed this level had been reached.'" [1]

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[1] *New View on Automation.* Joint Economic Committee. Congress of the US, Washington, 1960, p. 318.

The Soviet Union has made great progress in the building of supersonic passenger planes. In an article about the Soviet liner *TU-144,* the *Wall Street Journal* remarked: "Moscow leads the race now and will most likely stay in the lead." There has been equal scientific and technological progress in many other fields.

Industrial development, rapid scientific progress and the training of highly qualified personnel have enabled the Soviet people to build up a modern national economy, to eliminate age-old backwardness, to make rapid economic progress, and to defend the gains of socialism.

Whereas, in 1917, Soviet Russia produced less than 3% of the world's industrial product, in 1971 the equivalent figure was 20%. In 1913 the volume of indusrtial production in Russia was no more than 12.5% that of the United States. By 1950 it had grown to just under 30%, and in 1970 it was over 75%.

Higher labour productivity is an important indicator of technological progress. From 1950 to 1970 labour productivity in Soviet industry rose by 238%, while in the United States it rose by 81% in the same period, in France, by 170% and in West Germany, by 152%. The average annual rate of increase in labour productivity in Soviet industry over this period was twice high as in the United States. Thus, in economic competition, too, the socialist world has proved its superiority over capitalism.

Despite a somewhat faster rate of economic development in some capitalist countries (mainly in the first half of the 1960s), the socialist countries continue to be in the lead as regards

their overall rate of economic growth. The fastest developing industrial region in the world is still the group of socialist countries—members of the Council for Mutual Economic Assistance (CMEA)—which account for one-third of the world's industrial production, while the United States accounts for about one-fourth and the West European countries, a little over one-fifth of world industrial output.

Unity of scientific and social progress under socialism

Scientific and technological progress in the Soviet Union and other socialist countries has always been regarded as an important means for realizing the sweeping programme for building a new society. This approach to technological progress stems from the well-known Marxist thesis concerning the leading role of the productive forces in their interaction with production relations.

Lenin's theory of socialist industrialization was based on the key role of advanced technology in the building of socialism and communism. He wrote: "There can be no question of rehabilitating the national economy or of communism unless Russia is put on a different and a higher technical basis than that which has existed up to now." [1]

The adoption of the latest achievements of science and technology serves to strengthen the new social relations, relations free from exploitation, to eradicate social distinctions, to raise living standards and the general cultural level, and to ensure independence for the socialist countries.

Public ownership of the means of production, the planned national economy, the eradication of exploitation and class antagonism—all of this helps to fuse scientific, technological, economic and social progress into one whole.

Rising production efficiency and the growth of publicly-owned production in the conditions of the planned socialist economy are inseparable from a steady rise in living standards and the cultural level of the people. In the Soviet Union, from 1960 to 1970, real incomes rose by 58%. In the 1966-70 period they went up by 33%, considerably higher than for the preceding five-year plan period.

Of great significance for raising the overall standard of living in the Soviet Union is the continued growth and improvement of housing construction. The ravages of the last war and the fast growth of the urban population have created an acute housing shortage in many cities of the country, making housing one of the priority tasks of the nation. The Soviet Union leads the world in the rate and scale of its housing construction. Since 1913 the total amount of living accommodation in the USSR has grown by eight times. The amout of floor space in Moscow, alone, has more than trebled since 1940. In the period between 1950 and 1970, just on 200 million people moved into new flats. In addition, the rate of housing construction in the Soviet Union has been steadily increasing. For example, in 1966-70 more than

[1] Lenin. *Coll. Works*, Vol. 31, p. 419.

500 thousand million square metres of housing was built, which is the equivalent of 50 large cities, each with a population of one million.

For the most part housing construction is financed by the state, but some housing is undertaken by cooperatives.[1] Rent claims about 5% of the average earnings of a working man, and still less when there is more than one breadwinner in the family.

An important element of the socialist way of life is confidence in the future, which, together with other factors, is the result of the elimination of economic slumps and crises, the liquidation of unemployment and the full utilization of labour resources.

Under socialism the interaction between scientific and technological progress and employment is different from that under capitalism. When the achievements of science and technology serve not vested interests, but the interests of all the people, when technological progress is achieved on the basis of long-range planning, with high and stable rates of economic growth, then rapid scientific and technological progress does not breed such a social evil as unemployment.

From 1965 to 1970, labour productivty in Soviet industry rose by 32% (at an average annual rate of 5.7%). Industrial production rose by 50%, and there was a 15% increase in the number of factory personnel. With these rates

[1] Since all land in the Soviet Union has been nationalized, housing cooperatives pay nothing for the land required for their building.

of growth the Soviet Union still experiences a shortage of labour.

Under socialism all the key factors determining the scope and structure of employment in industry and offices—the volume and pattern of capital investment, the level of production and labour productivity—are subject to long-range planning. In addition, the state exerts an indirect regulating influence on all other sections of the working population. Working people in the socialist countries have no fear that the adoption of new technology will cost them their jobs. Characteristic in this respect is the observation made by Gérard Carrère, correspondent of the French journal *La Vie ouvrière,* who studied the effects of automation in the Soviet Union where he talked to workers and visited a number of industrial establishments (a similar study was made at the same time in the United States by another correspondent of the same magazine). Speaking of the growing rate of automation in the Soviet Union, Gérard Carrère wrote: "This revolution, which is yet in its budding stage, inspires still more respect for the power of man and reason, for a man who is not content with the production process alone, but who has put himself in control of economic and social progress and his own future."

Workers released by automation receive jobs elsewhere at the factory because of growing production. The French correspondent could see for himself that the workers had no fear of automation but, on the contrary, were ready to help introduce and extend it, and displayed a keen interest in it. There is nothing surprising

in this because technological progress facilitates the labour process and leads, eventually, to higher wages. However, it would be wrong to assume that full employment is achieved automatically under socialism. It is ensured only after a great deal of research, organizational and planning work by state control bodies, various scientific centres, economic, trade-union and other public organizations.

One of the most important tasks facing planning bodies under socialism is to ensure the most efficient use of labour resources under conditions of full employment. The growing efficiency in the utilization of labour resources is manifest in the higher rate of economic progress achieved which, in turn, makes it possible to combine, with full employment, a rapid rise in real incomes.

From the first days of its existence the Soviet Government, in setting out to build up the national economy and resolve social problems, attached great importance to higher and secondary specialized education. As a result, the Soviet Union, in the shortest space of time, was transformed from a country that before the revolution was largely illiterate, into an advanced industrial power with one of the world's highest standards of education. According to the 1970 statistics, 75% of the working population of the cities and more than 50% of farmers have secondary school or college education.

The rapid rise in the level of education and in the qualifications of the work force is part of the general technological progress in the socialist countries. Unlike the capitalist countries, public education and occupational training are

planned in the socialist countries with a view to their fullest practical application. The socialist states make technological progress a means for the all-round development of man and elimination of differences in the general educational level and technical qualification of various groups of workers. It is used to ennoble the labour process and make it more meaningful.

Surveys to examine the effects of the adoption of automation and other equipment of the latest kind at Soviet industrial establishments show that automation expands the intellectual functions of labour and increases the proportion of engineering, technical and skilled auxiliary personnel at factories and plants. Soviet industrial establishments provide all necessary conditions for raising the educational standards and occupational skills of workers and offer various advancement courses, a shorter working day and extended leave on full pay for workers who study by correspondence.

The social structure of Soviet society is also changing, leading to the gradual elimination of social distinctions. The exploiting classes—the bourgeoisie, big landowners, traders and *kulaks* (rich peasants exploiting hired labour)—have long since disappeared. And so have almost all the small producers in the countryside who, before the 1917 revolution, made up the great majority of Russia's population. Now Soviet society consists in the main of two friendly classes—the working class, which plays the leading role in the building of the new society, and the collective farmers. In addition there is a new and large socialist intelligentsia which, in the conditions of scientific and technological progress,

is rapidly growing both as to number and social importance. From 1959 to 1970 the number of persons engaged primarily in intellectual work grew from 20.5 million to more than 30 million. Socialist society is thus steadily becoming more socially uniform and classless in its structure. This process is being aided by intensifying the advance of the scientific and technological revolution, which, among other things, has the aim of achieving all-round mechanization and automation of production and industrialization of agriculture, by gradually eradicating the distinctions between town and countryside and between manual and non-manual workers and, finally, by raising the general educational and cultural level.

There has been continuing progress in the further democratization of Soviet society. In recent years this has been particularly manifest in measures to draw broad sections of the working people into the process of management, in the wider use being made of production meetings, workers' meetings and general meetings of collective farmers, in the adoption of the new rules and regulations for collective farmers, in the extension of the rights of republics and administrative areas, in giving industrial enterprises more say in the area of decision making, and, in general, in the further advancement of the principles of democratic centralism.

Creation of the material and technical base of communism

An advanced socialist society has been built in the Soviet Union as the result of spectacular

progress achieved in science and technology, in the country's economic development, and in the development of the socialist principles of social relationships and the cultural, social and political awareness of the working people. This has made it possible to begin work on a task of world-historical significance—the building of the material and technical base of communism, with the assistance of advanced science and technology as the principal means.

There is a close connection between communism and scientific and technological progress. Just as the industrial revolution of the 18th-19th centuries served to consolidate the rise of capitalism, the present scientific and technological revolution, by its own internal logic, serves the era of socialism and communism. Socialism has opened up the widest possibilities for advancing the scientific and technological revolution which, in turn, assures the necessary material conditions for carrying out the socialist reorganization of society. The consistent observance of the principle of socialism, "Everything for the sake of man, for the benefit of man," which expresses the most important and characteristic feature of socialism, has made it possible to utilize the tremendous achievements of the revolution in science and technology in the interests of all working people. The economy of labour thus achieved serves not the mercenary interests of a few monopolies, or of some other privileged groups of society, but is used for the fullest possible satisfaction of the growing material and cultural needs of all working people.

By reducing the amount of unskilled and

semi-skilled work in the conditions of socialism, society releases ever new sections of the working population for more productive activities, enables them to participate more actively in social and state affairs, and opens up new possibilities for the development of services to the public, for promoting individual talent, for making fuller use of the abilities of the working people, for improving skills and raising educational standards and for providing better amenities and more opportunity for recreation.

For many centuries man has been used as a means to achieve the economic development of society. Socialism has made it possible and necessary to make man the sole object of economic development, to utilize the achievements of the scientific and technological revolution in the interests of the people as a whole.

The revolution in the development of the means of production has created the necessary technical possibilities for enhancing the stature of man. Here, too, socialism and communism create the required social and political conditions. The scientific and technological revolution provides the material prerequisites for the emergence of a working man of a new type who uses his knowledge instead of mere physical strength. This is also the only way to accomplish a revolution in the area of consumption which is part of the programme for the communist transformation of society. The liberation of man from exploitation, and his becoming an integral part of a highly productive technology based on the latest achievements of science and having a planned economy and requiring the participation of the working people in industrial

management, prepare the necessary conditions for his all-round development, for the elimination of distinctions between mental and physical work, for work free from economic stimuli, and for transition to the communist principle of distribution according to need.

The 24th Congress of the Communist Party held in April, 1971, proclaimed as a key task the combining of the achievements of the scientific and technological revolution with the advantages of the socialist economic system, the broader development of Soviet society's own, socialist, forms of integrating science and production. In his report to the Party Congress on the work of the Central Committee of the Communist Party of the Soviet Union, the General Secretary, Leonid Brezhnev, stressed that the acceleration of scientific and technological progress continued to be one of the key tasks of communist construction. The directives approved by the 24th Congress formed the basis of the 1971-75 five-year economic plan drawn up by the Council of Ministers of the USSR and subsequently adopted by the Supreme Soviet of the USSR. The fulfilment of this plan will be an important step towards building the material and technical base of communism, and strengthening the economy and defensive capability of our country. The fulfilment of the Soviet Union's 9th five-year plan will provide further spectacular evidence of the great advantages of the socialist system.

The USSR's growing economic potential and the new requirements of the national economy, have made it possible, and necessary, to orient economic policy towards providing for a fur-

ther rise in the standard of living of the Soviet people. That is why the 9th five-year plan stipulates that the main task is *to secure a considerable rise in the standard of living and cultural level of the people on the basis of high rates of growth and greater efficiency of socialist production, scientific and technological progress, and an accelerated growth of labour productivity.*

In the period 1971-75 the national income of the Soviet Union will rise by 39% and the gross volume of industrial output by 47%. It is significant that the output of consumer goods will grow faster than that of the means of production. Huge sums will be invested in agriculture and in the production of consumer goods.

In the 9th five-year plan period a great deal of attention is being devoted to the intensification of production and to raising its efficiency on the basis of rapid scientific and technological progress. The index for labour productivity will rise by nearly 39%, which is of vital importance to raising living standards. For example, 80-85% of the total growth of the national income will be accounted for by higher labour productivity.

The five-year programme provides for the maximum utilization of the achievements of the scientific and technological revolution. The industries directly responsible for technological progress will have priority rates of growth. Such important branches as power engineering, the chemical and petrochemical industries, machine building and instrument-making, production of automated equipment, computers and machine-

ry to replace labour-consuming processes will increase production by an average 67%.

The capacity of power stations built in the 1971-75 period will total 65-67 million kilowatts. Nuclear power stations will account for 12% of the total capacity increment. The plan provides for large-scale construction of nuclear power stations, primarily in the European part of the country. The capacity of such stations to be brought into operation over a period of 10-12 years will total 30 million kilowatts.

In the previous five-year period, work was completed on the giant power grid covering the European part of the USSR. Under the new five-year plan the construction of a single nationwide power grid will continue.

In the 1971-75 period the production of instruments and automation equipment will be doubled. The manufacture of instruments for scientific research will also be increased. The production of computers will grow by 2.6 times, and of fully automated and semi-automated lines in the machine-building industry, by 1.6 times. The production of machine-tools with digital programme control, which will raise labour efficiency by 3-4 times, will be increased by 3.5 times.

The level of economic, scientific and technological development achieved in the Soviet Union has made it possible to plan the most ambitious projects, such as channelling off part of the flow of the powerful Siberian rivers to Kazakhstan and Central Asia. This tremendous project overshadows all the existing nature-transforming projects in the world. Western Siberia is rich in water resources which cannot

be used to full advantage locally. A network of canals in the arid areas of Kazakhstan and Central Asia will bring water to the fertile, sun-drenched soil of this large territory—twice the size of all the capitalist countries of Europe put together. It has been estimated that the flow of water here from Western Siberia will amount to about 250 thousand million cubic metres a year, comparable to a river as large as the Volga.

These data provide a good idea of the scope and rate of the progress made by the scientific and technological revolution in the USSR, which, in turn, provides a solid economic basis for the sweeping programme of social change being put into effect.

In addition to higher rates of pay for many categories of working people (teachers, doctors and other medical personnel, tractor drivers and farm machinery mechanics, etc.) which will take effect from 1972 to 1974, the public consumption funds which benefit all Soviet citizens, irrespective of their earnings, will also grow considerably. This will make it possible to further extend the medical service and school and college education, and facilities for the care of children.

Public consumption funds will be used to improve the living conditions of large and needy families, working women, pensioners and students. In this way, average real incomes will grow by 31%.

In 1971-75 measures will be carried out to ensure a more rational use of labour resources, to further improve working conditions, and to raise the qualifications and cultural level of the

population. The programme for the introduction of universal secondary education to the age of 17 will be completed everywhere in the country. As a result, the differences in living in rural as opposed to urban areas will become still less noticeable.

Under the 9th five-year plan, 580 million square metres of housing will be built, enabling about 60 million people to improve their living accommodation. The government has allocated large sums of money to improve amenities in Soviet towns and villages.

Improvement of economic control and organizational forms in industry

Scientific and technological progress demands a higher level of organization in industry and improved economic control, as was emphasised in the decisions of the 24th Congress of the Soviet Communist Party.

In this connection, raising the scientific level of national economic planning is of particular importance. The solving of key problems in the economic, social and political spheres calls for scientific planning not only over five-year periods, as was previously the case, but for much longer terms. Long-range economic planning based on population growth forecasts, the needs of the national economy and scientific and technical progress is a necessity. Long-range plans must be closely integrated with five-year plans and annual plans and must make use, on an ever wider scale, of econometric modelling and systems-analysis methods.

At the present stage of development of Soviet society the sphere covered by planning includes, to an ever great extent, various social processes. Over the past few years many industrial establishments, on their own initiative, have drawn up and put into effect comprehensive plans in the social sphere for their staffs. These plans include measures for meeting the material and cultural requirements of production and office workers, improving their working and living conditions, raising their qualifications and developing the talents and abilities of each worker.

In the 9th five-year plan period expansion of the Soviet economy is taking the form of a further concentration of production and the building of more industrial associations and amalgamated enterprises, which in future will become the main links in the chain of production organized on a self-supporting basis.

With the present extensive operational ties between factories, rapidly changing technology, and the greater variety of goods being produced, together with the more complicated pattern of industrial management, the adoption of computerized automatic systems has resulted in substantial savings. The modern automated systems of control now in use are fully intergrated systems that process information automatically and make use of econometric methods for determining optimal solutions. The Soviet Union is making use of hundreds of automated systems of control and of computer centres. It is estimated that their use resulted in savings, over the 1966-70 period, of 700 million roubles. At the present

time, they pay for themselves in two to three years, but it is believed that in the future this period will be considerably reduced.

The 9th five-year plan includes a sweeping programme for the automation of production. About 1,600 automated planning and control systems will be introduced into various branches of industry, territorial organizations, industrial associations and individual establishments. Eventually a nation-wide system to collect and process information will be set up for controlling, planning and regulating the national economy using a network of computer centres and a unified automated communications system for the whole of the USSR.

Work will continue on the measures being implemented as part of the economic reform begun in 1965. Such economic factors as cost-accounting, pricing, profitability, credit and material incentive encourage industrial enterprises to plan their commitments carefully, to improve quality and to adopt the latest achievements of science and technology. Cost-accounting is being widely introduced not only at industrial enterprises and collective and state farms, but also for higher economic entities (such as industrial associations and ministries).

The Soviet Union is building the material and technical base of communism in conjunction with the other socialist countries which are building their own material and technical base of a developed socialist and then communist society. Economic integration of the socialist countries is important because it creates favourable conditions for effective cooperation

in the field of scientific and technological progress.

The policy adopted at the 25th CMEA session in 1971 for the further economic integration of the socialist countries will be carried out in several stages over a period of 15 to 20 years. As the first stage the CMEA member countries have coordinated their plans for 1971-75.

An example of the sort of cooperation being practised is the joint work of the CMEA countries on standardizing the production of computers of different capacities to serve different purposes. Parts and whole units of these machines are made in a number of socialist countries and can readily be replaced by their equivalents manufactured in other CMEA member states.

In the future the regular methods of cooperation among socialist countries will be extended and combined with new forms. This will further expand and strengthen the ties between the countries in the leading industries and in science and technology, which, in turn, will expand and consolidate the world socialist market.

The realization of the complex programme will help the CMEA countries to make full use of the advantages of socialism and consolidate their collective position in the struggle for social progress, peace and international cooperation. It will help to facilitate the development of the productives forces, speed up scientific and technological progress and attain maximum efficiency in production and will raise living standards in the socialist countries and promote their cultural development.

Social problems of the scientific and technological revolution

Socialism creates the necessary conditions for the development of science, technology and the economy, and methods of economic and social regulation, that is, for the development of the entire system of social relations. This does not mean, however, that the advance of the scientific and technological revolution in the socialist countries generates no social problems.

In the Soviet Union one such problem is that of the rational utilization of labour resources. Some industries and areas suffer from a shortage of manpower. This is particularly true of construction and the catering industry, and is especially acute in Siberia and the Far East.

The Soviet Union has large potential manpower reserves. In the first place there is the large working population in the rural areas of the country. The measures adopted by the 9th five-year plan to strengthen the material and technical base of agriculture (capital investments in agriculture over the 1971-75 period will equal the amount invested in the previous ten years), to make farming more intensive and to raise the rate of growth of labour productivity, will release considerable manpower resources from the sphere of high-yield agriculture. Industry, also, has great possibilities for utilizing labour resources more efficiently. For example, it is possible to mechanize auxiliary processes such as loading and unloading, and measures are being taken in this direction. A new system of economic incentives has been adopted at some indus-

trial establishments which encourage the management to release surplus labour.

Of great importance in this respect is the creation of conditions for making the labour force more mobile and thus easier to employ to greater effect. The creation of such conditions necessitates combining stability of the work force at existing factories with the planned redistribution of manpower in order to use it in the new expanding industries and in developing areas of the country. The increasing mobility of manpower and the need for its re-location make new demands with regard to the assessing and planning of manpower requirements according to the industry and territorial distribution of labour and needed qualifications.

Over the past several years important measures have been taken to further improve the social, economic and administrative mechanism for redistributing labour resources. In 1966, for example, committees whose job it is to make the most rational use of labour resources were set up in all the republics of the Soviet Union. These committees operate an extensive network of agencies in cities and rural areas to inform people of vacancies and provide them with jobs.

Plans are under way to set up one single job-placement system for the whole nation.

Of equal importance are economic measures to promote the redistribution of the work force and its channelling in strategic directions. In the current five-year plan period wages will be raised for workers employed in the Urals, the northern areas of the European part of the country, in Western Siberia, in most of Kazakhstan, in some areas of the Far East, in East-

ern Siberia and in Central Asia. The building of homes, community service establishments and catering and cultural centres is proceeding rapidly in the newly industrialized areas in the northern and eastern regions of the USSR.

The all-round development of man has become a task of great importance in the conditions of the transition to communism and the advance of the scientific and technological revolution. To accomplish this task calls not only for higher standards of education and a high cultural level, but also for a commensurate ideological advance, for a communist attitude to labour, for high moral standards. With the development of the productive forces and growing satisfaction of material needs arises the necessity to fight any consumer-oriented approach to life, and to cultivate new attitudes that are in keeping with and that will foster man's natural desire for self-expression and creative activity, for the development of his talents and abilities.

Many new, weighty problems have emerged in connection with the preparation of young people for their working life. To choose a trade or a profession is no small problem. Despite the fast development of specialist and technical training in the USSR, its scope and structure are still lagging behind the growing demands of modern life. The number of young workers attending trade and technical schools is not yet big enough to keep pace with the increasing number of young working people.

Sociological studies carried out in the Soviet Union show that in choosing their work or speciality Soviet young people have sound values and are highly motivated. On finishing school

most young people want to continue with their education. Most school leavers questioned said they wanted to work in the field of science and technology.

A questionnaire circulated for a number of years among school leavers in Leningrad and the Leningrad Region shows that the leading motive of the young people in choosing their speciality was interest in, and the meaning of the work; the motive second in importance was the significance of the chosen field for the national economy, while considerations of pay came last. [1]

Sociological studies show that the intellectual and cultural level of the leisure pursuits of workers under socialism is rising. At the same time a considerable proportion of non-working time is taken up with household chores, which shows that the sphere of services has not yet been sufficiently developed.

Rapidly growing cities, the complicated economic and social structure of urban agglomerations give added importance to the problem of urban development. Soviet cities are built and reconstructed strictly in accordance with individual plans drawn up for each city. Big advances have been made in town planning in Soviet times.

Urban development in the USSR is regarded

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[1] The results of this poll stand in striking contrast to the results of a study carried out by British sociologist Th. Veness among the pupils of comprehensive, grammar and technical schools in Britain, who put considerations of pay ahead of all other motives (Th. Veness. *School Leavers, Their Aspirations and Expectations,* London, 1963, p. 185).

as an important part of the programme of communist construction, an important means of improving the working and living conditions of the Soviet people. On the one hand, urbanization tends to add to the differences between town and countryside, but on the other it tends to remove these distinctions by drawing the entire activity of society into the sphere of influence of the supreme achievements of civilization. This second aspect is now of greater importance. Cities have been assigned the leading role in the process of bringing town and village closer together, a process which will eventually eradicate all difference between them. This does not mean that villages should be incorporated in cities. Instead, the idea is to bridge the age-long gulf between them by promoting and absorbing the best features of both urban and rural life.

The problem of environmental pollution is much less acute in the Soviet Union than in the industrially advanced capitalist countries. Nevertheless, in many Soviet cities and industrial areas the problem is serious enough. The absence of class antagonisms and contradictions, the development of the national economy according to a unified long-range plan, and the concentration of large financial and material resources in the hands of the state have created favourable conditions in the Soviet Union, and similarly in the other socialist countries, for successfully solving the problems of environmental protection. Vigorous measures have been taken recently to ensure protection of the country's water resources and cleanliness of the air. The Soviet Union is the first country in the world to

have enacted legislation limiting atmospheric pollution.

In 1971 the Supreme Soviet of the USSR adopted a law making nature conservation a mandatory consideration in the designing of any construction project or operation of an enterprise.

Lake Baikal, with its unique natural wealth, has received special attention in the way of conservation measures. The lake is not only the world's largest fresh water reservoir, famous for its rare species of fish, but is also an area of unique plant and animal life, one of the few places on earth where nature has retained her pristine beauty. In a special decision in September, 1971, the Central Committee of the Soviet Communist Party and the Council of Ministers of the USSR introduced sweeping measures to ensure the rational use and protection of the natural wealth of the lake and its surrounds. The decision set rigid deadlines for the completion of purifying installations at the industrial establishments which discharge drainage water into Baikal, and prevented the opening of the pulp-and-paper mill built there until the completion of its purifying system. This important decision also provided for cleaning the rivers leading to the lake of rotted wood, and banned the rafting of raw timber on these rivers.

Similar nature protection measures are being taken in other parts of the Soviet Union. Design organizations are drawing up technological plans providing for the full utilization of waste in industry and agriculture.

These and many other problems are being solved, and will continue to be solved in the course of building communism, on the basis of accelerated scientific and technological progress, efficient planning and control of economic and social processes, and by drawing to the fullest extent on the initiative and creative activity of the people.

By their practical work the socialist countries have shown that the scientific and technological revolution can and must be made to serve man. The combining of the achievements of science and technology with the communist transformation of social relations is the formula evolved by history itself for the society of the future.

Н. Гаузнер
НАУЧНО-ТЕХНИЧЕСКАЯ РЕВОЛЮЦИЯ:
СОЦИАЛЬНЫЕ ПРОБЛЕМЫ И ПОСЛЕДСТВИЯ

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